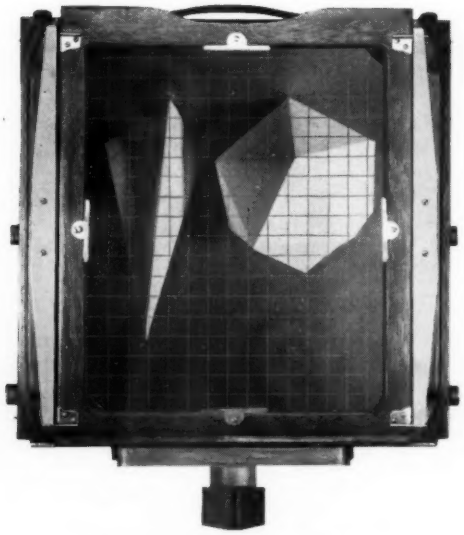
PMI

VOL.2 NO.10
OCTOBER
1 9 5 9
PRICE 50c

PHOTO METHODS FOR INDUSTRY

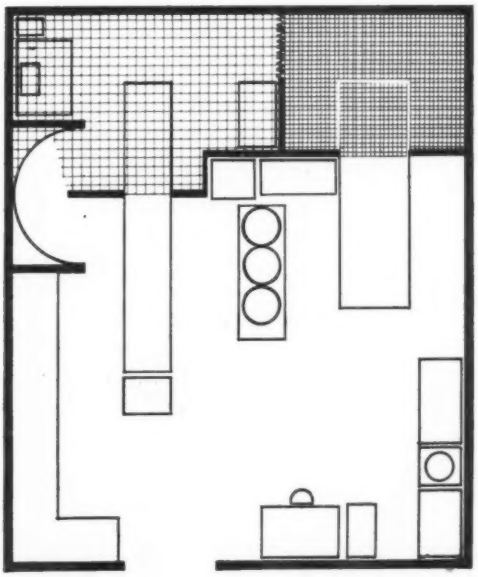
PHOTO MANAGEMENT SEMINAR

ROTI SCANS OUTER SPACE



TONE REPRODUCTION

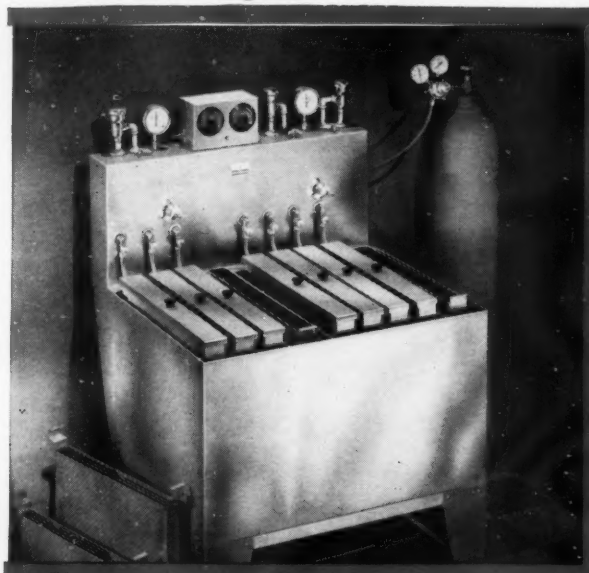
DIPLESS, DUNKLESS DARKROOM



why calumet color processors turn out clean sparkling prints up to 20" x 24"

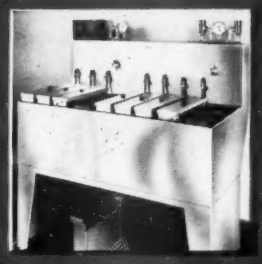
1 Nitrogen Burst agitation and temperature control assure clarity, uniformity

2 Calumet Streak-Free Processing Basket* eliminates all "screen marks" on prints

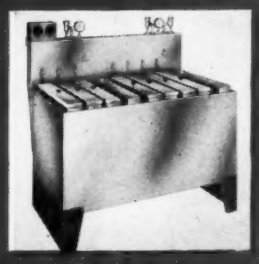


CALUMET'S light light-proof covers enable you to process your color prints in normal room light!

16 x 20 Calumet Color Processor for 16 x 20, 11 x 14 and 8 x 10 color prints. 3½ or 10 gal. capacity

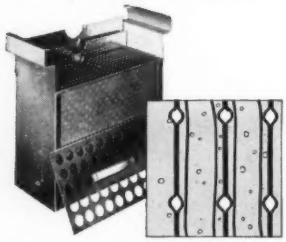


11 x 14 Color Processor for 11 x 14, 8 x 10 color prints, 3½ gal. tank capacity



20 x 24 Calumet Color Processor for 20 x 24 prints. 10 gal. tank capacity

Special Calumet Streak-Free Processing Basket



Calumet Processing Basket, divided by partitions in which prints are placed, has curved protrusions on each partition wall which keeps print from touching wall. Fluids pass between paper and walls when solution is agitated. This unique basket carries a guarantee—never to cause marks on prints. Cut-away top makes it easy to take prints out.

Now you can process color prints in sizes 8 x 10, 11 x 14, 16 x 20, and 20 x 24 inches...and be SURE they will be wonderfully bright and clear

Among the many reasons why Calumet Color Processors get such superior results in processing color prints are the advance features you find ONLY in Calumet equipment. These features are illustrated and spelled out in a fascinating 12-page color processing catalog. You owe it to yourself to read and keep this booklet on your reference shelf. It opens wide the informative door to the new world of color. Get your copy now!

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The makers of Adox Film announce

INDUSTRIAL PICTURE-OF-THE-YEAR AWARDS

The prizes:

FIRST PRIZE: New Minolta SR-2 Single Lens Reflex Camera (automatic diaphragm—instant return mirror), plus automatic 55 mm, f:1.8 lens; automatic 35 mm, f:2.8 lens; automatic 135 mm, f:2.8 lens... the basic elements of the Minolta SR-2 Single Lens Reflex System of Photography.

SECOND PRIZE: New Minolta SR-2 Single Lens Reflex Camera (automatic diaphragm—instant return mirror), automatic 55 mm, f:1.8 lens.

THIRD PRIZE: World famous Minolta Autocord Twin Lens Reflex Camera.

The rules:

1. Submit any number of black and white pictures (no smaller than 3¼ x 4¼) taken during 1959 in line with your work as a professional photographer.
2. The following data must be indicated on the back of each entry submitted: the entrant's name, address, camera used, film, exposure, plus developing data if available and the name of your photographic dealer.
3. Contest closes midnight, January 31, 1960. All pictures become the property of The FR Corporation, and may be used for reproduction and promotional purposes. (Releases must be available if requested.)
4. Mail all entries to Adox Industrial Awards, 951 Brook Avenue, New York 51, New York.
5. All winners will be notified by mail.

Read about the almost unbelievable resolving power of Adox Film

Have you wished you could blow up a 35 mm or 120 size negative to mural size without your print "falling apart"?

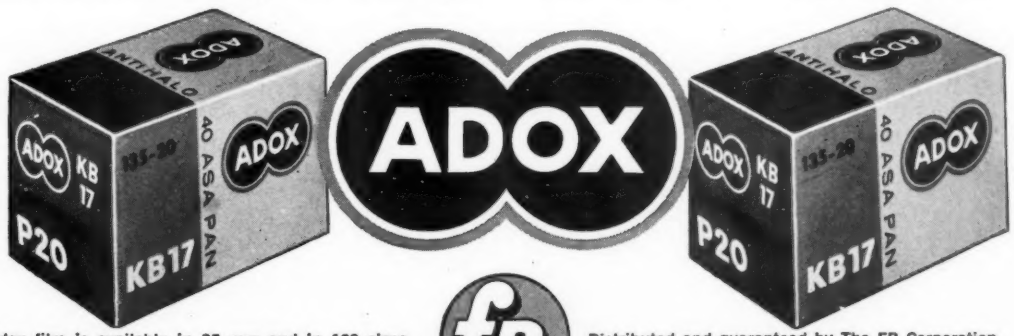
Have you wished you could enlarge a small portion of a negative and still retain crisp detail—even in the shadowy areas?

Then... Adox is the film for you. No hocus pocus or black magic! The secret is inherent in the Adox emulsion—ultra thin, with ultra small silver halide crystals.

Therefore, during exposure, there is less image distortion (irradiation)... plus a definitely superior contour sharpness (acutance) . . . and graininess is almost non-existent.

Combine these two factors—finer grain and freedom from distortion—and you get Adox film's ultimate advantage... highest resolving power! Adox KB-14, for example, resolves 150 lines per mm, automatically enabling your lens to attain its top-tested resolving power.

But the final test, of course, is up to you. Put Adox through your most exacting tests. Judge it according to your most critical standards. See if you too don't agree with other professionals—that Adox film is in a class by itself!



Adox film is available in 35 mm and in 120 sizes with ASA ratings of 20, 40 and 100 at FR Franchised Dealers everywhere.

Distributed and guaranteed by The FR Corporation. Sold by FR Franchised Dealers everywhere.

Get more information. Circle 438, page 83

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TIME THE DIFFERENCE! Because Vapo-Vel is Control-Coated and stays fresh longer, it makes-up at more consistent speeds and prints back faster than other sepia intermediates. You save time and material working with Vapo-Vel.

POST VAPO-VEL

Longtime leader in intermediates, POST Vapo-Vel is better than ever

After years of intensive Lab research into intermediates and related coating technology, POST has incorporated certain changes in its famed Vapo-Vel (209). For reproduction people, this recently modified sepia-tone vellum has every important feature needed for quality work.

First of all, the high actinic opacity of the image has been coupled with special transparentizing techniques (greatly minimizing background discoloration). These combine to assure exceptional printback speeds and prints of maximum contrast. Printback production 15% to 25% faster than ordinary sepias is not unusual with 209.

Shelf-life and superior drafting qualities have not been sacrificed because of these top-notch reproduction characteristics. Comparative tests show that Vapo-Vel keeps fresh longer, holds its original printing speed better without the dirty pink cast in the background so often associated with ammonia process sepias. Vapo-Vel produces clean-looking prints that invite modification work and handling on the drafting board.

Newly improved Vapo-Vel has other "plus" features: 1) a "no-bleed" image that guarantees there will be no image diffusion in file or after repeated use as a master print; 2) full development rate (*one* pass for complete development); 3) minimum curl—Vapo-Vel prints come off the machine flat; and 4) a unique ability to achieve image build-up—weak subject matter can readily be improved from a poor original by making 2nd and 3rd generation Vapo-Vel prints.

The make-up speed of Vapo-Vel is set at a moderate rate, carefully balanced to consistently yield prints with all of these superior features.

For the draftsman, equally important characteristics are built into Vapo-Vel: easy-to-read dark brown images give sharp line contrast as well as extremely good readability through the back; outstanding drafting qualities with good erasure and simple eradication; durability and strength from the 100% rag premium base; and superior filing characteristics.

In reproduction shops, prime requirements in a sepia reproducible frequently vary. Whatever your principal interest, newly improved Vapo-Vel passes every test.

Which of these factors are most important to you?

Actinic Opacity *(printback)*
Background *(co nued transparency)*
Line Contrast *(image density)*
Quality of Reprint
Shelf-Life
Image "No-Bleed" *(on aging)*
Development Rate *(complete in one pass)*
Image Buildup *(of poor originals)*

CHECK FOR YOURSELF! *Write today for a generous sample package to test newly improved Vapo-Vel (209) against your present source. To keep up-to-date with the latest, write Frederick Post Company, 3666 N. Avondale Ave., Chicago 18, Ill.*

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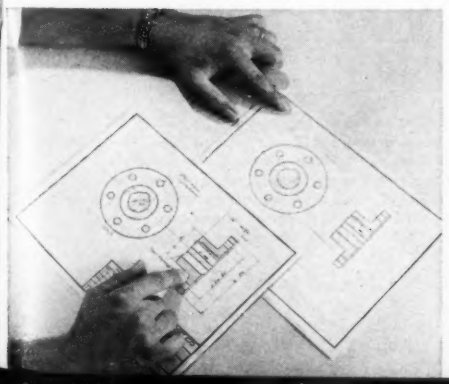
SEE THE DIFFERENCE! The print you prefer is POST 209 Vapo-Vel. Notice the image density and clean background, the sharp contrast and "see thru" transparency. Vapo-Vel prints have no image diffusion — come off the machine flat.

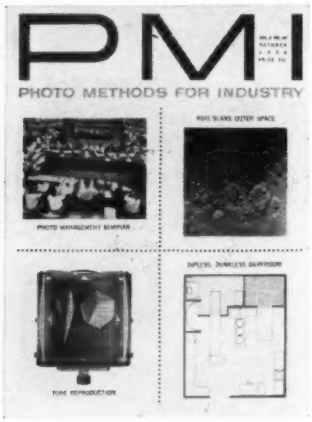


CUT DOWN WASTE! Because newly improved Vapo-Vel leads a long and happy shelf-life, you reduce spoilage to a minimum. Tell-tale dusky pink discoloration is no problem with Vapo-Vel quality prints.

PROTECT ORIGINAL DRAWINGS! File your original drawings safely away after reproducing them economically on a Vapo-Vel intermediate. Then use the Vapo-Vel later as a master for future prints and possible subsequent changes in the drawings.

OCTOBER, 1959

VOL. 2 NO. 10



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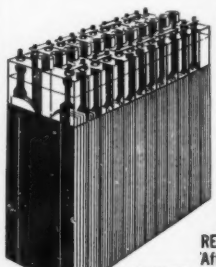

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F.Y.I.

Fatal charm describes quite accurately a number of pitfalls, including, in the magazine business, the compiling of charts and directories. While the general reaction to our researches has been favorable, we have received more than a fair number of reminders covering our various sins, both of commission and omission. When the first garlic-scented missives arrived, the initial reaction was punitive action. The Yong Dong Po *Shopper* has a full staff and the Irrawaddy *Monday Review* was filling up fast when we looked around and found that we had no editors left.

In all fairness to our wayward pressniks, it must be pointed out that not all the sins are ours. A directory compiled from data sent in late or not sent in at all would be almost as large as the ones we published. In some cases, the information upon which our mailings were based was wrong. A couple of defunct firms, still listed in trade directories, received requests for information while other firms, far from defunct, were overlooked. One of the reasons behind the directory movement at PMI is to bring information up to date so that in some future editor's paradise, when a directory will be published, every firm and every product will be listed in the proper place and with the correct information. But until such time, corrections and apologies will remain in order. We made the apologies, now for the corrections.

Department of correction

In the section on In-Plant Cine Processors (August), Burke and James was listed as distributors of the Stineman System. A letter from Stineman informs us that their equipment is handled by all leading industrial dealers including Willoughbys, Williams Brown and Earle, Fuller and d'Albert and Eastman Kodak Stores. To bring the information up to date, the Stineman System consists of stainless steel reels and tanks for developing 16mm, 35mm and aerial film, plus printing equipment. For details, write The Stineman System, 918 Sunset Boulevard, Los Angeles, Calif.

In the July Electronic Flash Directory, we left out Chadwick-Helmuth's *Strobex* and *Camera-Sync* units. The former is a stroboscopic light with a flash rate from 0 to 100 fps visual, 0 to 30 fps photo. Color temperature is 6500° and light output is 50 candle-sec/flash at 16 fps, photo, and 10 candle-sec/flash at 100 fps, visual. Price is $385 to $395. *Camera-Sync* is a system for making vibration pictures in conjunction with the *Strobex* light. Price is $435 to $445. For details, write to Chadwick-Helmuth Company, 472 East Duarte Road, Monrovia, Calif.

In our listing of Rental Equipment, the name of Hollywood Camera Company, 10611 Chandler Boulevard, North Hollywood, Calif., was inadvertantly omitted. They have a full line of camera, lighting and editing equipment available.

This seems to complete our diet of crow for now but—manufacturers, remember to return future questionnaires early.

Personal news about people

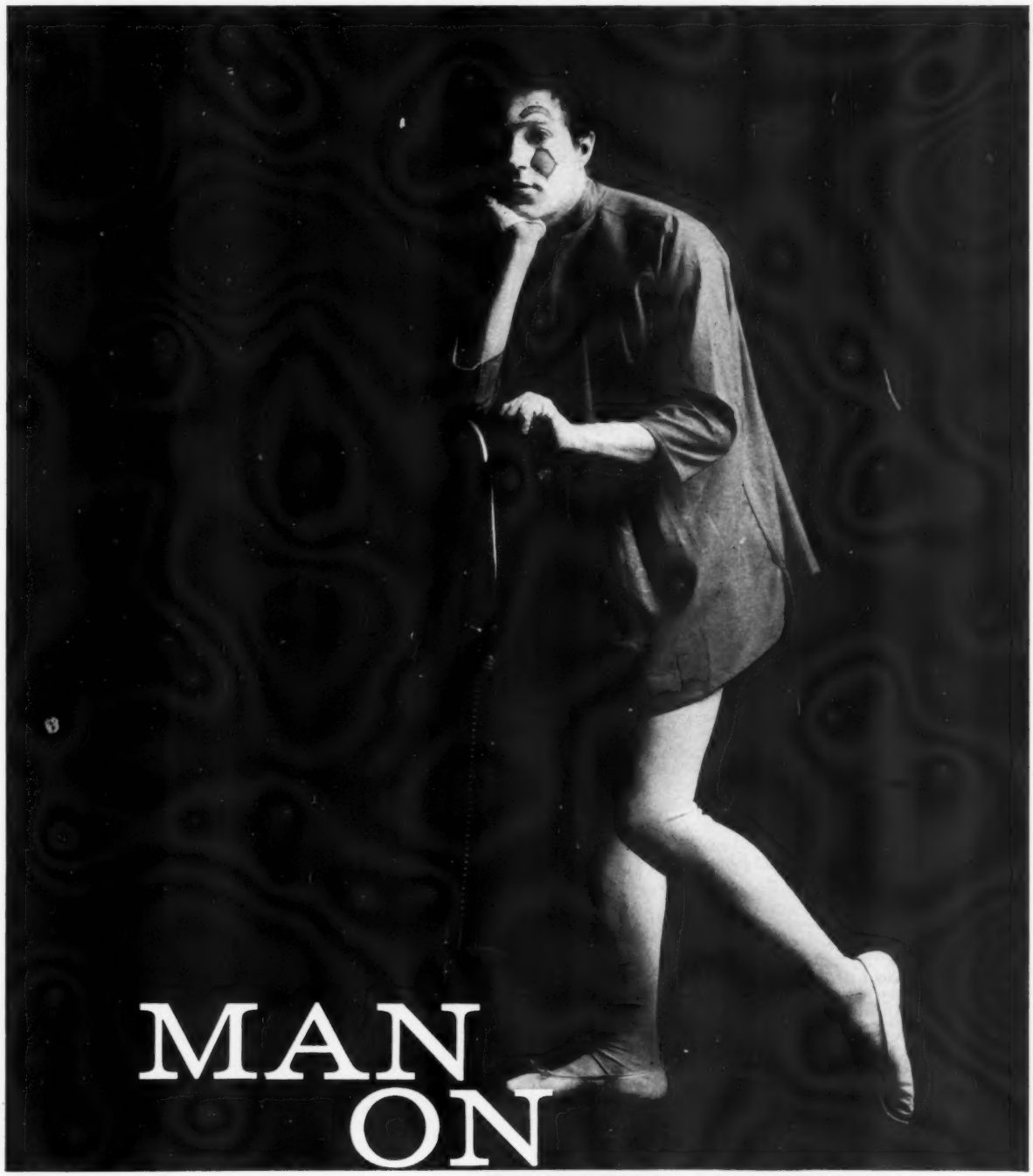
Various honors, appointments and miscellaneous personal goings-on have been brought to our attention.

Dr. Herman Duerr, Ansco's Technical Director, has been awarded the Herbert T. Kalmus Gold Medal of the Society of Motion Picture and Television Engineers for outstanding achievement in color motion pictures. Dr. Duerr, who came here from Germany in 1931 when he joined Agfa Ansco, was active in the development of Ansco color films, especially Super Anscochrome. Leica fans of the thirties will remember him as co-author of a chapter on mercury hypersensitizing in the pre-war *Leica Manual*. The award was presented at the SMPTE convention just held at New York's Statler Hilton.

Learned doings in photography

Literary note: *Proceedings of the 8th Annual Meeting* of the National Microfilm Association, edited by Vernon Tate, is available from the Association, Annapolis, Maryland.

(*continued on page* 10)



MAN ON STICK

Keeping "on the stick" is no easy job for any photographer. Good materials help a lot. JET® paper, to name one. It's the only high-speed projection emulsion that contains a special fluorescent agent to brighten high lights, extend tonal ranges. JET'S cold, brilliant tonal characteristics make it a *must* for all critical industrial work. Tip: get "on the stick" . . . get JET! Ansco, Binghamton, N. Y., A Division of General Aniline & Film Corporation.

Ansco

Jet

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E OR Q ?

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EP-1000

ET-20

ER-30

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The most sensitive photometer for on and off easel color negative and Ektacolor print exposure and color balance control.

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- Micro film and photo copy.
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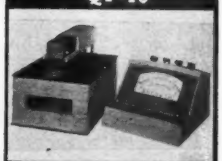
All QuantaLog instruments, both "E" and "Q" series have the same high sensitivity and stability. Slight differences in the optical systems, controls, etc., were included to better suit the needs of the user. For complete literature on either of the above instrument lines, the name and address of a dealer in your area who will demonstrate the equipment, address correspondence to Department A-1, Macbeth Instrument Corporation. Please specify "E" or "Q" Series when inquiring.

QP-10



QT-20

QR-30

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F.Y.I.

(*continued from page* 8)

Priced at $7.50 for non-members, $3.75 for members, the 5½ x 8½ paper-bound book, printed by offset from typewriter script, contains the text of 25 papers presented at the meeting, along with illustrative and other material.

While on the subject of Dr. Tate, two months ago we mentioned his fancy for Delaware Bay crabs. Our learned microfilm expert growled the other day that he wouldn't cook a Delaware Bay crab if it sidled right into his kitchen, and pleaded, in an Oxford accent "take me, Tate." Worse yet, the good doctor's Chesapeake Bay neighbors have been snubbing him ever since they saw the misinformation in PMI. From now on, Dr. Tate, we will mention nothing but Chesapeake Bay crabs in PMI. We'll even refuse ads for any other kind.

"The Industrial High-Speed Photography Institute," at the University of Wisconsin in Madison, evidently is made up of people who like to practice what they preach. The whole show will take but two days, October 20 and 21. According to our Madison (Wisc. not Ave.) sources, the program is just about "firmed" (also concretized and solidified).

Among the high-speed stars to be included in the sessions are David B. Eisendrath, Jr. and Edward Farber of PMI, Harold Edgerton, Richard Painter of GM's Engineering Photography Department and Bruce McBride, one of the most indefatigable of Kodak's Tech Reps who know the answers even before you ask a question.

Others on the agenda include: Robert Shoberg, Beckman & Whitley; William Hyzer; Carlos Elmer of SMPTE; Morton Sultanoff, Ballistic Research Laboratories, Aberdeen Proving Ground; Robert Ratner, who will welcome the members on behalf of the University.

The Society of Photographic Instrumentation Engineers and the Engineering Extension at UCLA are offering a course on "Engineering Applications of Photographic Instrumentation," Eng X 454DEF, given at UCLA beginning September 29. The eighteen sessions will cover such topics as "Optics and Basic Camera Components," "Electrical Circuitry," "Schlieren and Shadowgraph Techniques" and "Range Tracking Instrumentation," among others. Tuition is $45. For details, write Department K, University Extension, University of California, Los Angeles 54, Cal.

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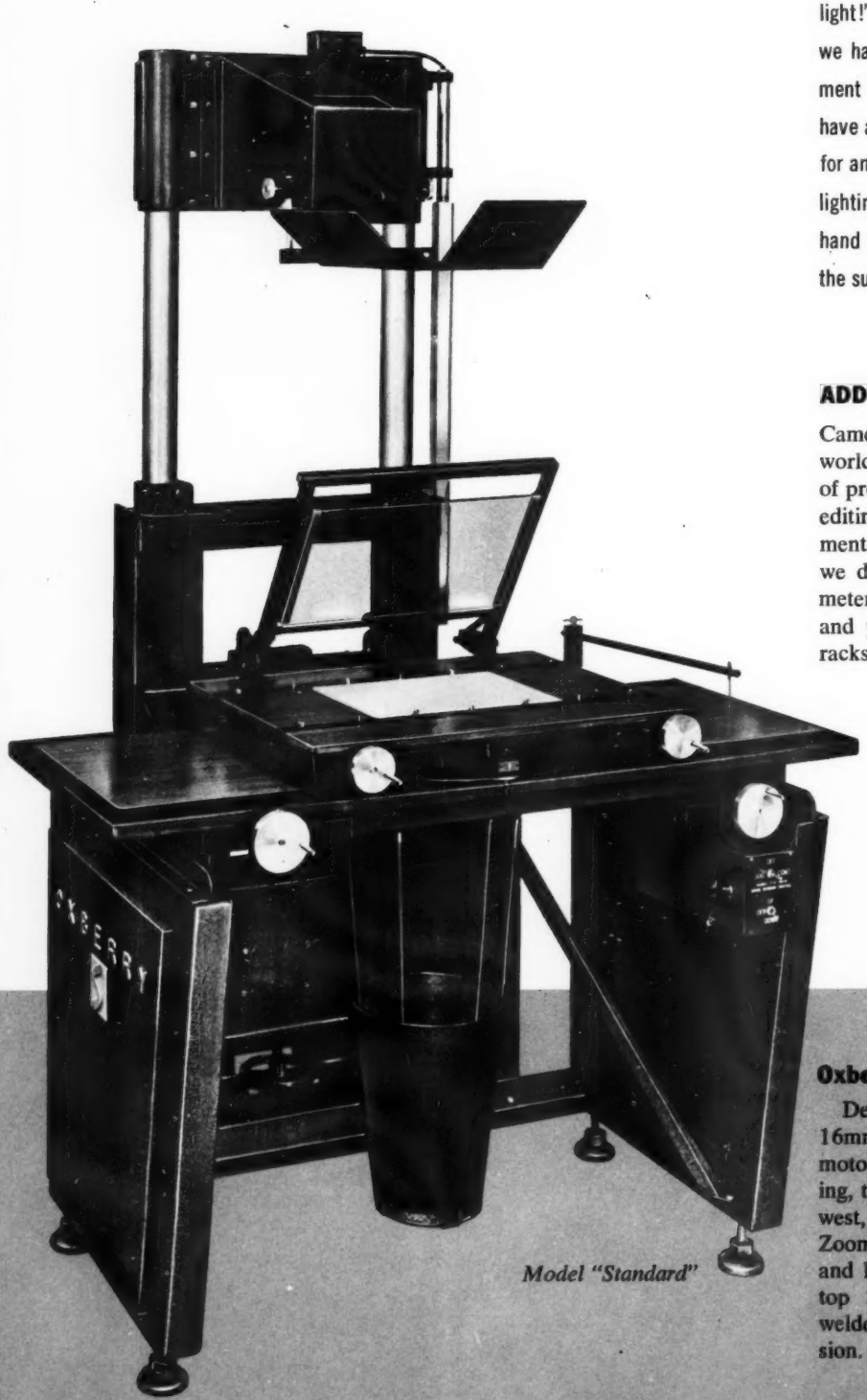

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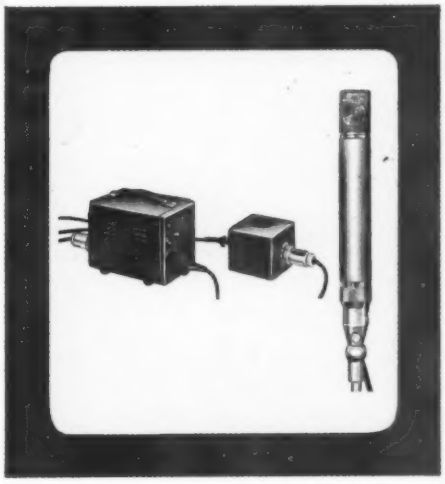

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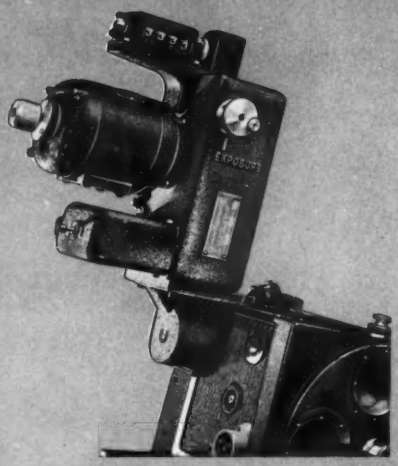

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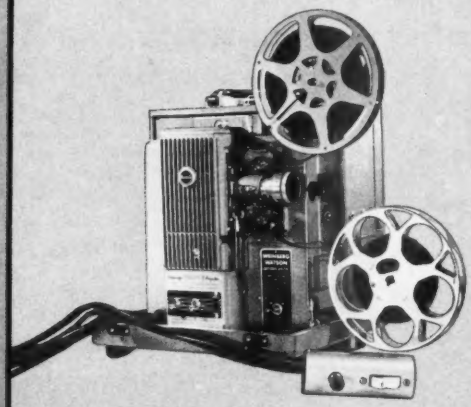

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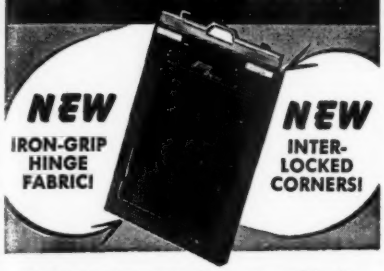

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COMING UP

OCTOBER 5-9 86th Semi-Annual Convention of the Society of Motion Picture and Television Engineers, Statler-Hilton Hotel, New York, N. Y.

OCTOBER 22 American Speedlight lecture and demonstration for Industrial Photographers Association of America, Essex House, 1050 Broad St., Newark, N.J.

OCTOBER 26-30 National Convention of the Society of Photographic Scientists & Engineers, Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER 16-20 Fifth International Automation Exposition and Second Military Automation Exposition. The New York Trade Show Bldg., 500 8th Avenue, New York, N.Y.

MONTHLY MEETINGS

FOURTH MONDAY • Rocky Mountain Industrial Photographers. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. Telephone PEarl 3-2200.

LAST MONDAY • Southern California SPSE. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

SECOND TUESDAY • New England Police Photographers. Contact Sergt. William R. Murphy, Brookline Police Dept., Brookline, Mass. RE 4-1212.

THIRD TUESDAY • Binghamton Chapter of SPSE. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573.

SECOND & FOURTH THURSDAY • Industrial Photographers Association. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. OX 4-2058. Or R. Handley, The Port of New York Authority, 111 8th Ave., New York 11, N. Y. AL 5-1000, Ext. 605.

PMI includes this section as a service to its readers. If you wish to have your organization's meetings listed in future issues send the necessary information addressed to **COMING UP, PMI,** *33 West 60th St., N. Y. 23, N. Y.*

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by David B. Eisendrath, Jr.

WORKING PHOTOGRAPHER

More comments on memory jogging, plus some mnemonics

Last month I discussed some of the little tricks used to keep photographers from forgetting to pull dark slides, not leave equipment at home or on the job, and so on.

I have always contended that good photography is good habit. If you have your technique down to such a routine that you always pack your cases the same way every time and when you pull a dark slide—you always put it the same place and don't have to look for it—you are a good operator and can concentrate on what you want to make of a picture rather than how to make it and you're probably a pretty good photographer. Good habit is developed through practice and experience and a good deal of thinking about why you do every little thing.

Practice, man, practice

Learning to be a good photographer is very much like learning how to drive a car or how to make love. You can read all the books in the world—but there's nothing like first-hand experience.

However I find myself constantly confused on certain simple things that I don't use every day, and often on the differences of similar subjects. Some of the best ways (for me) to keep things straight is to learn little poems or tricks about them. Lexicographers call these *mnemonic* systems (from the Greek "mindful"), meaning to aid the memory.

"Thirty Days hath September, April, June, etc." is probably well known to every person literate in English. A similar system for remembering which months have thirty or thirty-one days is one which has you counting off months on the knuckles of the clenched fist. The high points of the knuckles all represent thirty-one day months (January, March, May, etc.) and the depressions in between are the shorter months. All except February which has twenty-eight, except on leap years (and Grandpa who will be ninety in Fall).

I've been collecting mnemonics for years, some of them photographic, many of them amusing, and maybe you not only would like to know what they are and use some of them yourself, but I hope enough readers will have some of their own that they'll send on and I'll report on them at a later time.

Clocks, Frances and Biv

New Yorkers with their complexity of one-way streets learn early that *E*ven streets go *East*. If you're confused about time zones, there's an old jingle in bad rhyme that says "As you travel W*e*st, the time it does grow l*e*ss; as you travel *East*, the time it does incr*ea*se." And if you have trouble remembering how to set your clocks when going to and from Daylight Saving Time, just remember your friend Dave's reminder about the clock, to *Spring Forward* or to *Fall Back*. That's the way to set the hands.

I've always distinguished between the male Francis and the female Frances by remembering the combinations of: h*Im*, h*Is*, Franc*Is* and h*Er*, sh*E*, Franc*Es*. Maybe you'd also like to know that if you're puzzled about differentiating between stalactite and stalagmite and which grows up and which grows down, I always remember that "stalac*tites* stick *tight*." They stick tight to the ceiling, of course.

Do you know Roy G. Biv? I first met him in high-school. His initials give the sequence of colors in the spectrum: red, orange, yellow, green, blue, indigo, violet. Not very scientific colors, but indigo (a violet blue) is considered as one of seven primaries. Anyway, Roy G. Biv has helped me many times to remember the order.

There are some good ones associated with photography. I remember the difference between the 81 and 82 series Light Balancing filters because "the filter *BLUE* is eighty *TWO*." An alphabetically correct order is A to

(*continued on page* 18)

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WORKING PHOTOGRAPHER

(*continued from page* 16)

W, reminding myself to always add *ACID* to *WATER*, never the reverse. I also remember the difference between the one-solution Farmer's Reducer and the two-solution Farmer's Reducer by remembering that one-two is also a sequence which reminds me that since exposure always comes before development, the *ONE*-solution reducer is used to correct density caused by overexposure, the *TWO*-solution reducer to reduce density caused by overdevelopment.

I always think of acetic acid as 28-38: to make a 28% solution from glacial, use 3 parts of acid to 8 of water. (And as we said before, always add acid to water.)

When Eastman Kodak changed the names of Type C and Type R to Ektacolor and Ektachrome Type papers, respectively, I discovered the EktaColor and Ektach*R*ome system for keeping them straight. Or you may prefer to remember that Koda- and Ekta- chromes are reversal materials that go on reversal paper. When I used to teach photography years ago I used to distinguish between sodium sul*fate*, sul*fite*, and sul*fide* by remembering that it was the *FATE* of photographers to work in hot places (and sulfate goes into tropical developers). Sul*FITE* is the r*IGHT* chemical for developers, and sulfi*De* *D*arkens silver, *D*on't keep it in your *D*arkroom.

Also remember that f/16 is the magic number for average subjects in bright sunlight. At this stop, exposure time is the reciprocal of the exposure index. Examples: A color film has an exposure index of 32. Bright sun, average subject—exposure: 1/30 sec. at f/16. With an exposure index of 100, use 1/100 sec.

The Kodak people have been teaching amateurs the word *FAST*: *F*ocus, *A*perture, *S*hutter, *T*hink! Don Mohler of General Electric has been similarly using the word *FLASH*: *F*ocus; *L*ighting; *A*perture; *S*hutter; *H*old steady. There is also *GAD* for *G*uide number is *A*perture times *D*istance, and also *SAP* for *S*implicity, *A*rrangement and *P*unch: the keys to what makes a good picture.

One of my favorites is one that came from an anonymous (because they want it that way) contributor at Eastman Kodak: *HTDCS*: this stands for *HOLD THAT DAMN CAMERA STILL!!!*

If you have any pet memory tricks, send 'em in. If they're interesting, I'll get up some more on 'em at a later date, if I remember!—THE END

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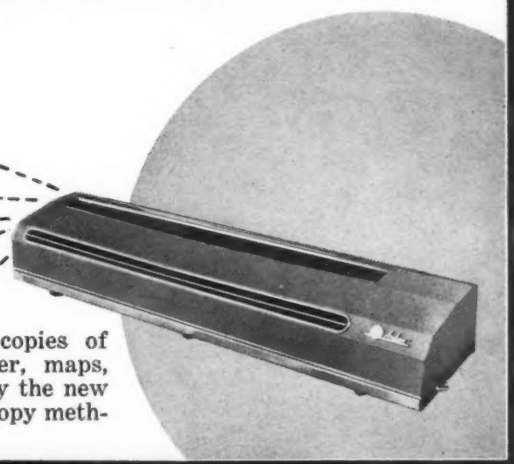

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by Arnold Eagle

INDUSTRIAL MOTION PICTURES

Get a good 16mm projector, and keep it up to snuff—here's how

The answer to the problem of good quality 16mm projection does not necessarily lie in switching to 35mm but may well lie in improving projection equipment, facilities and practices. There is no doubt that a good 16mm film, screened with presently-available modern 16mm equipment on a screen adapted to viewing conditions and projected with care and intelligence, will very nearly equal 35mm performance. This point of view supported very ably by John A. Maurer. In an article "Development Possibilities in 16mm Projectors" (SMPTE *Journal*, February, 1957), he pointed out how 35mm standards can be attained in every respect using currently available 16mm equipment.

Before the Second World War, most 16mm projectors were designed strictly for the amateur market. When the Armed Forces tried to get portable projectors for their entertainment and training programs, they found that available equipment was unequal to their demands. In 1941, an SMPTE committee issued a report on 16mm projection for education groups. This report played an important part in guiding the formulation of specifications for 16mm projectors for the services. Chairman of this committee was the same John Maurer who wrote the 1957 article.

The JAN standard

Armed forces specifications for a 16mm projector were embodied in ASA Standard Z521-1944 and resulted in the manufacture of JAN (Joint Army-Navy) Spec projectors. These standards and specifications have stimulated some of the larger projector manufacturers to bring out projectors which embody, or at least approach, the goals of high-quality 16mm equipment.

Three major problems afflict 16mm projection. First, there are many obsolete projectors in use with substandard performance. Second, many projection rooms are improvised and inefficient. Third, projector operation and maintenance is woefully inadequate.

Solutions involve getting rid of very poor projectors and completely overhauling substandard equipment, providing permanent projection rooms with proper seating and screening arrangements, and paying more attention to the selection and training of people handling projection equipment.

It is just as important to have responsible people maintaining the equipment as using it. Every projector should be tested periodically for quality and standards. Even the best of projectors will show signs of wear after long periods of use. If, during a test, the performance of the projector falls below acceptable standards, it should be overhauled at the time of the test, instead of, as is too often the case, waiting for the machine to break down completely.

Latter day improvements

Many improvements have been made by projector manufacturers to prolong the life of their products. Don't forget, a worn projector not only does not give as good service but it can shorten the life of the print. The Kodak Pageant, for example, has a pull-down claw made of carbide metal. This claw gets a great deal of wear, engaging the film more than 75,000 times during a one-hour screening. Victor has sapphire-tipped pawls that are self-aligning.

Better lubrication systems are also being provided. Bell & Howell's Filmosound uses an oil reservoir and automatic metered oiling of moving parts. This projector also has permanently lubricated, sealed ball bearings. The Pageant is permanently lubricated at the factory and requires no further lubrication. The Bell & Howell Specialist has a projection time counter to record the hours of use, an aid in planning a

(*continued on page* 22)

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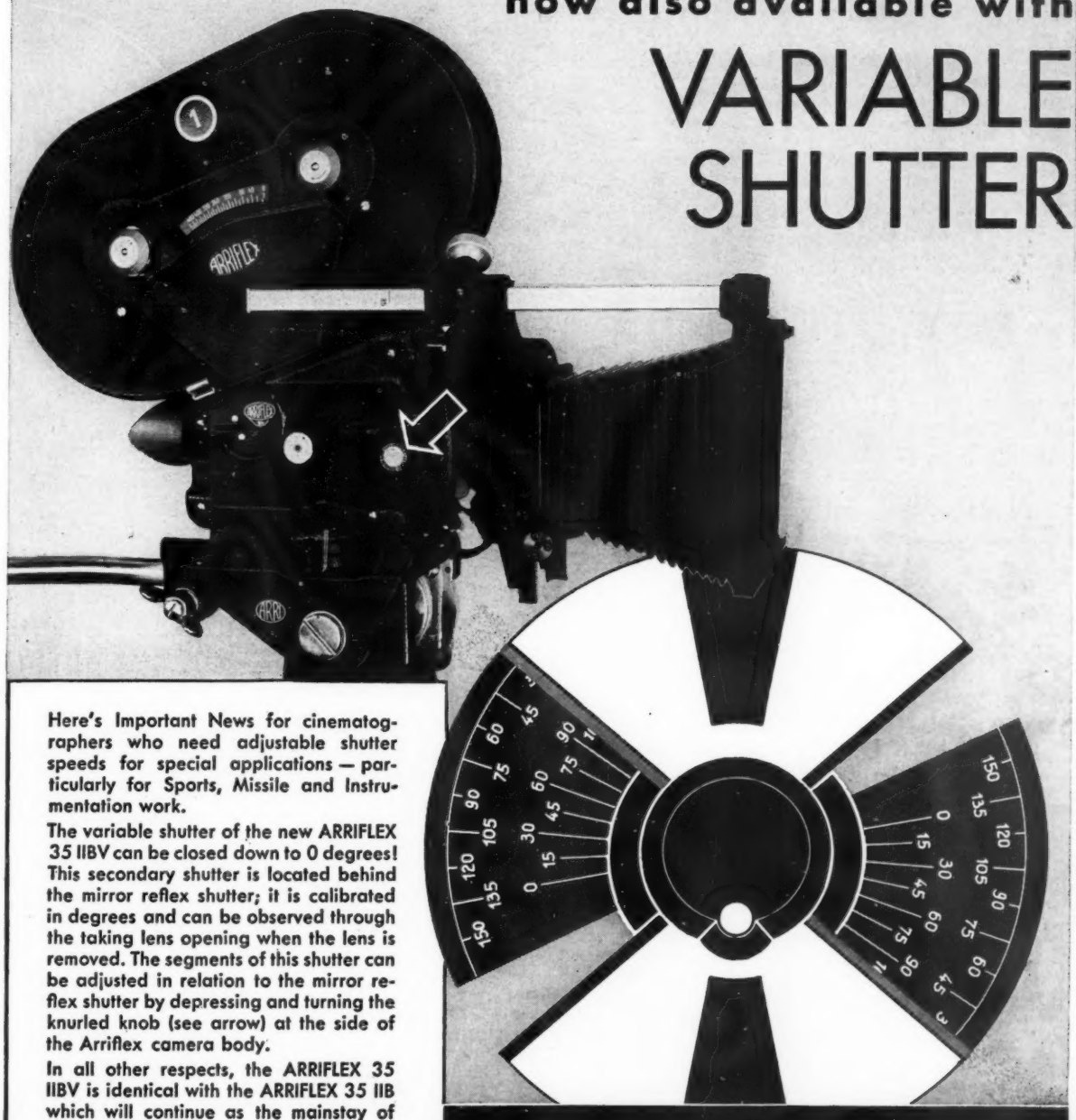

Here's Important News for cinematographers who need adjustable shutter speeds for special applications — particularly for Sports, Missile and Instrumentation work.

The variable shutter of the new ARRIFLEX 35 IIBV can be closed down to 0 degrees! This secondary shutter is located behind the mirror reflex shutter; it is calibrated in degrees and can be observed through the taking lens opening when the lens is removed. The segments of this shutter can be adjusted in relation to the mirror reflex shutter by depressing and turning the knurled knob (see arrow) at the side of the Arriflex camera body.

In all other respects, the ARRIFLEX 35 IIBV is identical with the ARRIFLEX 35 IIB which will continue as the mainstay of the line.

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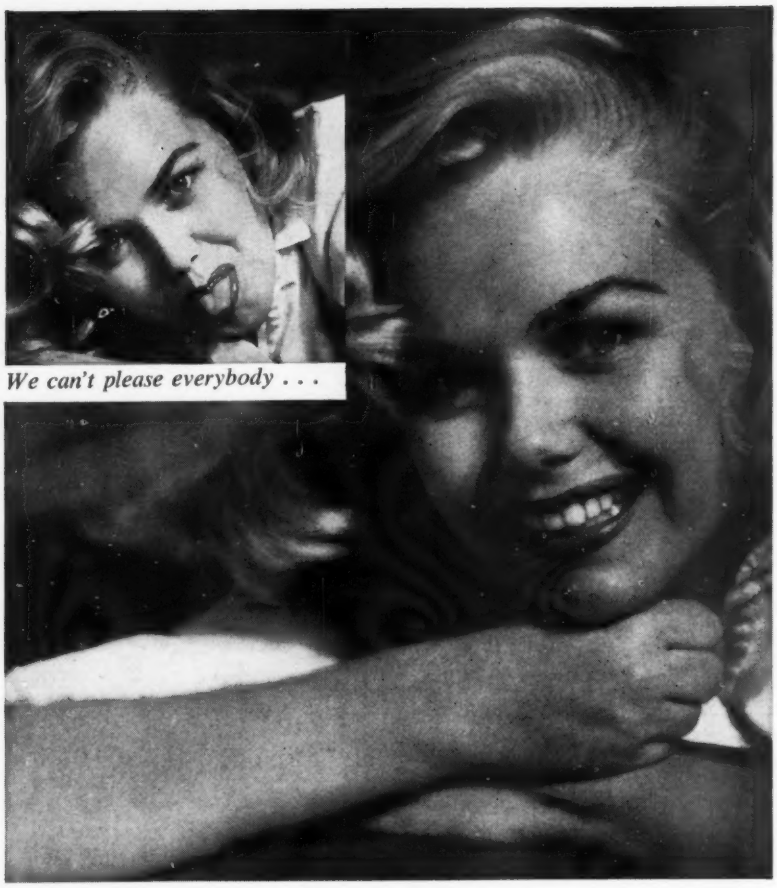

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INDUSTRIAL MOTION PICTURES

(*continued from page 20*)

maintenance schedule. With proper scheduling, it should not be too difficult to ensure trouble-free film projection.

Time is especially important with projection bulbs. Most manufacturers will provide data on life expectancy of projector and exciter bulbs, tubes, lubrication and general overhaul requirements, etc. It is up to the projectionist to avoid trouble before it starts, not go into a repairman's act in the middle of an important screening.

An aid in determining standards of performance for 16mm projectors is the series of test films available from the Society of Motion Picture and Television Engineers, 55 West 42 Street, New York, N. Y. One of these films is the 16mm Sound Service Test Film, 320 ft. long and selling for $18. This is a combination of several different test sections with explanations; a sound focusing test section to check the position of the sound lenses, a buzz track test to find if the sound track is in the correct position around the sound drum, a frequency test section with twelve frequencies to check audio-reproduction sections on title music, dialog, piano and orchestra music. The latter are useful for checking projection room acoustics.—THE END

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Summicron f/2 optical characteristics approach theoretical ideals. Their in-use advantages are very real, and readily apparent. Over-all performance surpasses not only the high-speed lenses, but of even more significance, the "slower" lenses long revered for superior image quality.

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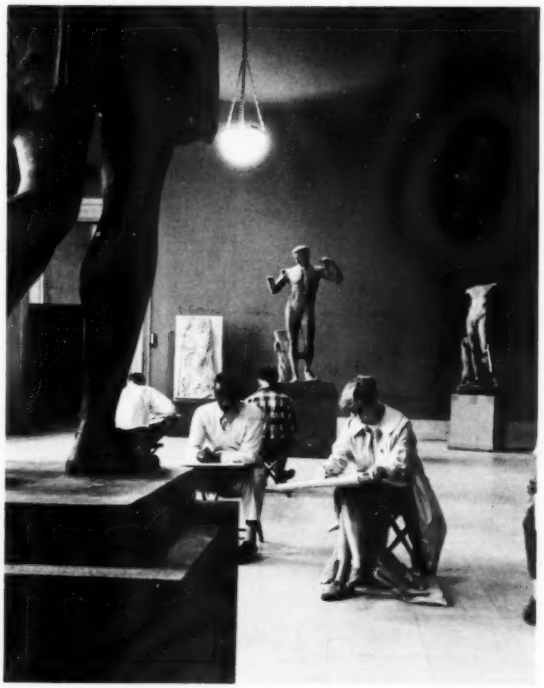

At any aperture a Summicron f/2 delivers more resolution, image contrast and freedom from distortion than any lens of comparable focal length.

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optimum aperture clicks in at f/4

Exciting as the wide-open performance is, the advantages of Summicron image quality over other lenses are even more dramatic at smaller apertures. The Summicron, at f/4, reaches a level of resolution, image contrast and freedom from aberrations never before approached in camera optics. The Summicron hits a higher optimum—reaches it faster—and holds it longer. At any aperture smaller than f/4, all you gain is depth of field. And unlike other high-speed lenses, when the picture situation calls for f/11 or f/16, a Summicron continues to deliver with no shift in focus, no loss in picture quality.

superior image quality at all distances

All Summicron focal lengths deliver superior image quality from infinity down to closest camera-to-subject distances. This is due to the basic formula, the integrity with which it is manufactured, and to the matched mounts and "custom" rangefinder cams adapted to each assembled Summicron, to assure precise rangefinder focus—on *every* Leica camera ever manufactured.

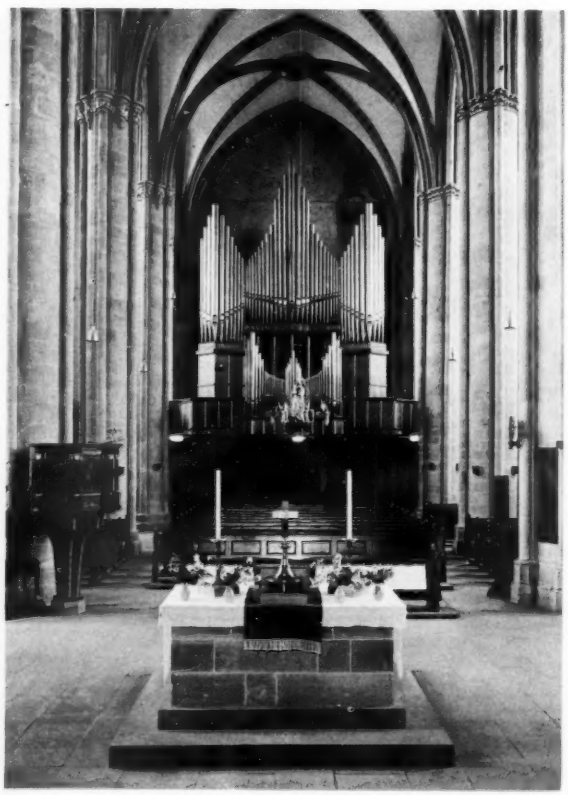
soft-coated internal elements

All internal elements in Summicron lenses are *soft* coated for greater efficiency. A single uncoated surface of a single element reflects 4 to 7% of the light that hits it. Hard coating reduces that figure to 2%—a notable improvement. Soft coating further reduces internal reflections to 1.2%! Soft coating costs more, is more critical to apply—and more efficient. External front and rear elements are hard coated for maximum durability.

optics with mechanical advantages

No detail has been spared in Summicron lenses to help you make better pictures. You sense this from the moment you first work with a Summicron, the ease with which it handles on the camera, the smooth working focus drive, the linear diaphragm settings (equal spacing between all apertures) —even the raised dot index which lets you change lenses in complete darkness. You see the quality in the finish of the lens, in the finely etched numerals and depth-of-field scale, in the click-stops (half-stops on the 90mm). All three Summicron f/2 focal lengths employ *parallel* focusing mounts for added accuracy. In addition to increasing reliability and focusing ease (even in temperature extremes), parallel mounts are more convenient when setting or reading distance and aperture scales.

The 35mm Summicron f/2 is eminently suited to architectural photography, such as this church interior which makes full use of the lens' wide angle of view and added depth of field. The 35mm Summicron is also invaluable in close quarters, for landscapes, and for fast off-the-cuff candid pictures.



Summicron lenses in use

With a maximum aperture of f/2, you can naturally take more "existing light" photographs with high speed black-and-white and color films. Equally important, with f/2 aperture you gain wider use of the high-resolution, fine-grain emulsions–to retain image quality even in poor light conditions. You work with confidence in the knowledge that Summicron image quality is consistent–at all distances –at any aperture–over the entire 35mm frame. And with the Dual-Range 50mm Summicron, you can move in on any subject to a penetrating 19" and get Summicron-sharp close-ups (with range-finder focus and automatic parallax compensation). What's more, this provision is always with you and your Leica.

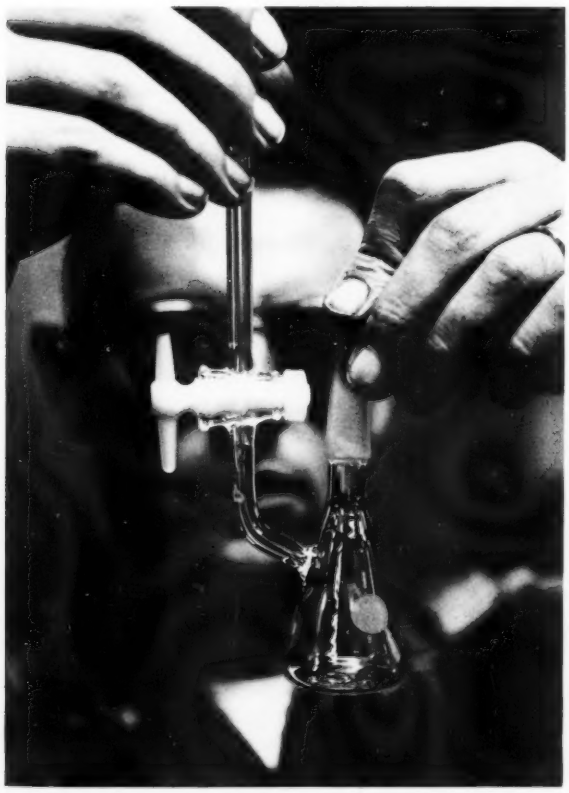
the Summicron Team

Summicron image quality has given rise to a new outfit being used by more and more Leica owners. They call it the Summicron Team : the 3 most often-used focal lengths, all with top optical performance and matched apertures from f/2 to f/16. With "the Team," you can interplay the 64° coverage of a wide angle, the 45° coverage of the 50mm and the selective 27° coverage of the long focus to any subject matter.

did you know these Summicron facts?

Leitz Summicron lenses employ the latest rare earth Lanthanum optical glasses with higher refractive indexes (greater light-bending power) lower dispersion (higher color fidelity) and high ultra-violet absorption • Summicron lenses are neither "warm" nor "cold" in their color rendition. They do not filter out any of the visible spectrum by intent or by accident • The 50mm and 90mm "lens heads" can be separated from their focusing mounts, for dual use on Leitz enlargers, copying and repro accessories • A share of the credit for Summicron performance must go to the modified-Gauss formula which uses critically computed internal air-spaces to do the work of additional lens elements.

The 50mm Dual-Range Summicron f/2 is probably the most desirable "normal" lens in photography. In addition to high image quality and high speed, its Dual-Range feature lets you add the drama of candid close-ups–as near as 19"–with range-finder focus and automatic parallax compensation.



The 90mm Summicron f/2 with its high speed, adds new versatility to the already versatile 90mm focal length. It is ideal for head-and-shoulder portraits, such as this existing light study, as well as in stage and sports photography, candids from afar and photo-reportage.

THE LEITZ LENS HERITAGE

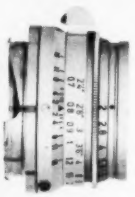
UNCOMPROMISED IMAGE QUALITY

It is no coincidence that these new Summicron f/2 lenses were developed by Ernst Leitz. For they are but the latest in a series of lens developments in which the guiding rule has been *uncompromised image quality*. The lens designer has at his disposal an infinite combination of variables—more than 300 different types of optical glass—in any variety of thicknesses and curvatures. He can work with any number of elements and many differences in air spacing. In short, from the combinations and permutations, there must come order, and optical quality. And there must be facilities for converting that masterly design into a lens to take pictures—and into thousands of lenses for thousands of cameras. Any break in the link, from design to end use, and all other steps are wasted. That the results are so consistently noteworthy with Leitz lenses is due to a rare level of optical experience—with microscopes, lenses and cameras—and a traditional devotion to quality that has been nurtured for over 110 years. This is the Leitz Lens Heritage, and these are the lenses that benefit from it:

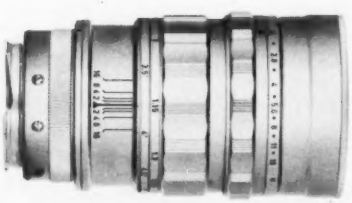
21mm Super Angulon f/4	50mm Summicron f/2	90mm Elmarit f/2.8
28mm Summaron f/5.6	50mm Elmar f/2.8	90mm Elmar f/4
35mm Summicron f/2	50mm Elmar f/3.5	125mm Hektor f/2.5
35mm Summaron f/2.8	65mm Elmar f/3.5	135mm Hektor f/4.5
35mm Summaron f/3.5	85mm Summarex f/1.5	200mm Telyt f/4.5
50mm Summilux f/1.4	90mm Summicron f/2	400mm Telyt f/5

50mm SUMMICRON f/2 The 50mm focal length is the traditional "normal" lens for 35mm cameras. Its 45° angle of view and favorable depth-of-field are two reasons why most photographers use the 50mm for most of their pictures. The Dual-Range Summicron—with focus and automatic parallax compensation to 19"—is probably the most useful 50mm focal length in photography. The 7-element 50mm Summicron is available in rigid bayonet mount for Leica M-Series cameras, or in collapsible thread mount at $129; and in the Dual-Range model for M-Series Leicas at $168.

35mm SUMMICRON f/2 The 35mm focal length with a wider angle of view (64°) is used for relating the subject to its background, for covering a large picture area from close quarters. It is indispensable to the photo journalists, who use its added depth-of-field for zone focusing, when the assignment calls for fast, off-the-cuff shooting. The 35mm Summicron f/2 is free of distortion; features oversize front and rear elements for peak performance at full aperture; and includes a convenient finger-tip focusing lever. The 8-element lens focuses to 2'4" and is available in bayonet mount for the Leica M-2 or in thread mount at $174; in bayonet mount for Leica M-3, with RF Attachment—that couples the rangefinder and viewfinder to the 35mm focal length—$207.



90mm SUMMICRON f/2 The 90mm long-focus lens provides 1.8x magnification compared to the 50mm focal length. It is most useful for head-and-shoulder portraits, candids from afar, news, theater and sports photography. The 90mm Summicron f/2 features a lightweight mount for steady, hand-held shooting (even at slow speeds); a built-in telescoping lens hood; click stops and half stops. The 6-element lens is available in bayonet or thread mount (rangefinder coupled) at $199.50; also available in short mount for use on the Visoflex II at $192.00. A short focusing mount is available for the rangefinder model permitting dual-use on your Leica and with the Visoflex II.



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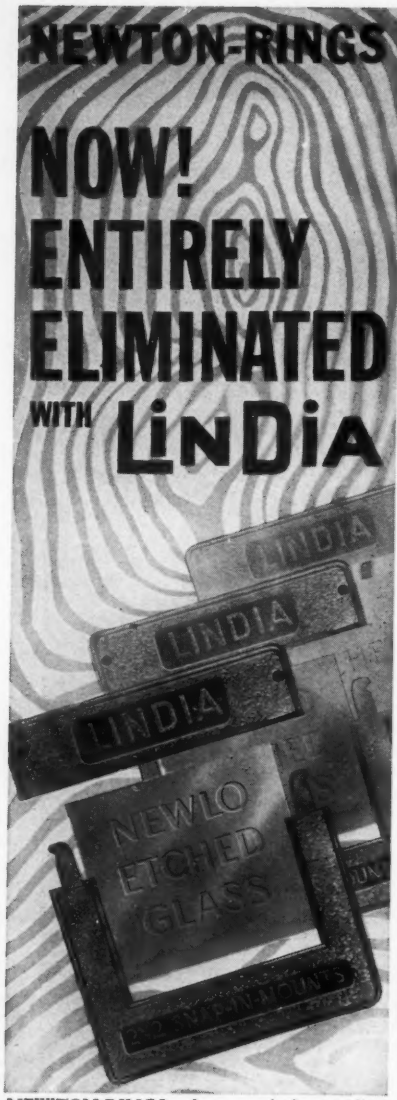

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by Vernon D. Tate

MICROREPRODUCTION

Reduction ratios: 1/100 is possible; commercial limits are less

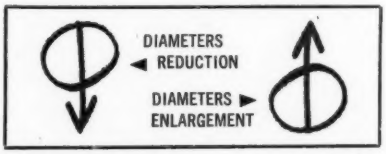
The proof of the pudding, as the old saying goes, is in the eating; this is certainly true in microphotography. Although it is interesting to read and speculate about technology and applications, it is infinitely more interesting and profitable to personally make enough microfilm to gain a practical understanding of the principles involved. There are individuals active in the field who have never personally made any microfilms. Sometimes this deficiency is embarrassingly apparent, as in the case of the salesman who could not understand that a negative microfilm could be made on motion picture positive film. Besides it is a lot of fun to make microfilms.

By definition a microcopy is a photographic copy of any original, usually a document of some kind, made at a degree of reduction too great for the copy to be read by the unaided eye. This means that a microcopy of an ordinary book page 6 x 9 in. in size printed in 10 point type is made at a reduction ratio of at least 6 to 8 diameters. In practice 10 diameters reduction is about the lowest used unless for some special application.

Defining terms

The term ratio of reduction should be completely understood. There are really two measures of ratio of reduction, namely linear and area. If the 9 x 6 book page just mentioned is reduced 8 diameters linear, it would produce a microfilm page 1⅛ in. high by ¾ in. wide. An area reduction would reduce the 54-sq.-in. surface of the original to .84375 sq. in. which is obviously the square of the linear reduction. This is understandable, for leaving out of account certain tricks used in photomechanical work, reduction is always proportional; if the length of a document is reduced, the width is reduced in the same degree. In microphotography when reduction is specified, linear reduction is meant.

There are several useful ways of expressing ratio of reduction concisely. It may be stated as a fraction of the original size, as in the example under discussion ⅛ meaning that the result is ⅛ the linear dimensions of the original, or alternatively X8. The writer for his notes uses the symbol on the left *(below)* to mean "diameters reduction." Since ratio of enlargement is also important and always linear, the expression 8X or 8 times the linear dimensions of the reproduction is sometimes used. The writer uses another symbol meaning "diameters enlargement" in his personal notation *(right, below)*.



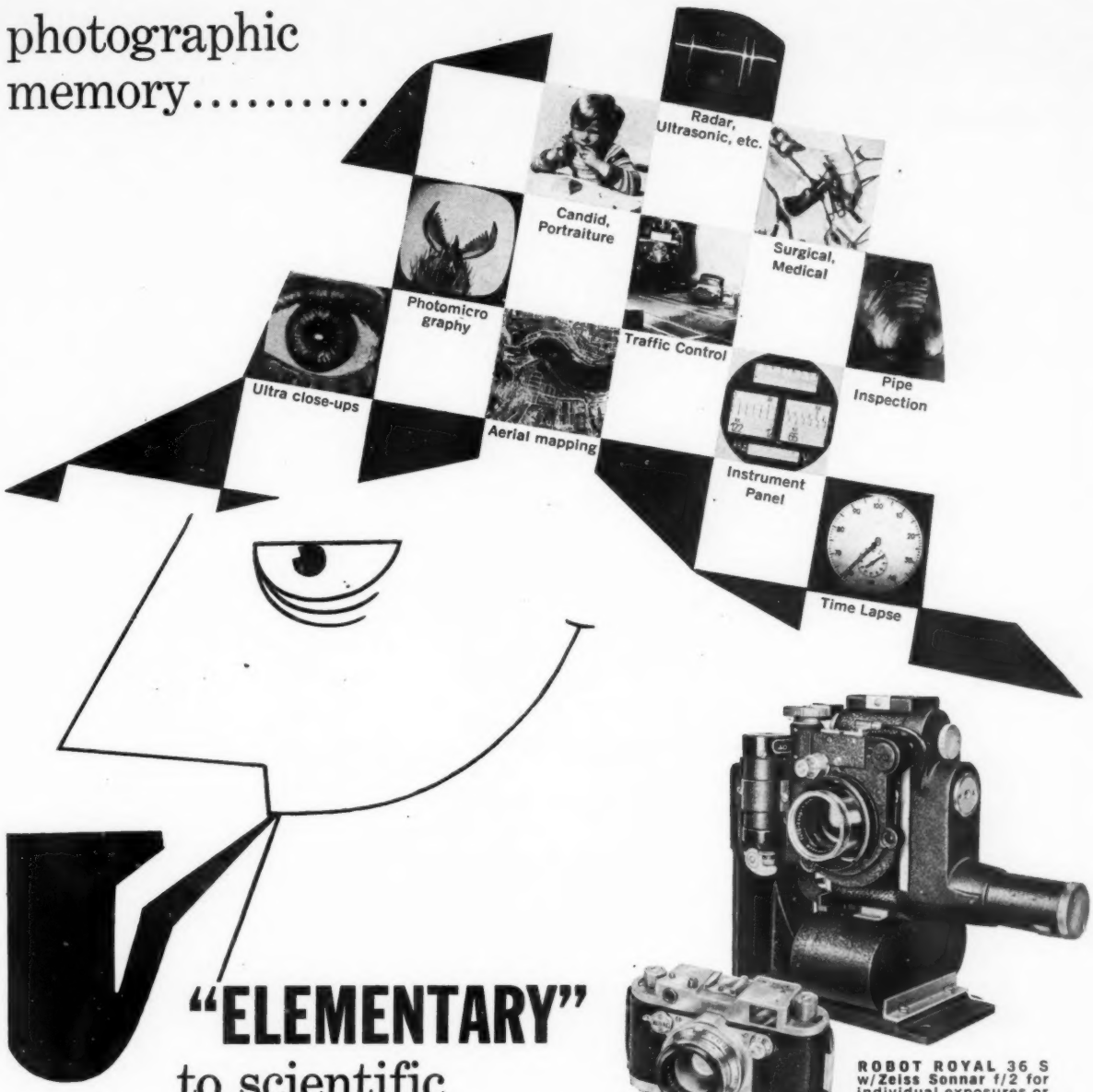
Ratio of reduction is one of the most important and least systematically considered factors in microphotography. It is one of the cornerstones of the art, for the ability of the technique to reproduce originals at considerable degrees of reduction and to make effective use of the copies so produced is basic. The economics of the situation which allow copies to be produced cheaply, or below the financial limitations of competitive processes is also basic.

The secret dot

Ratio of reduction is not a simple matter. It is a function of the nature of the original itself, the camera, lighting, resolving power of lens, film and processing, methods of intended use and many other factors including cost. Commercial working applications presently range upward to about 40 diameters. Laboratory and experimental work have demonstrated the practicability of making reductions in excess of 100 diameters. Interestingly enough, some of the early 19th century microfilms were made at much greater reductions

(*continued on page* 30)

photographic memory.....



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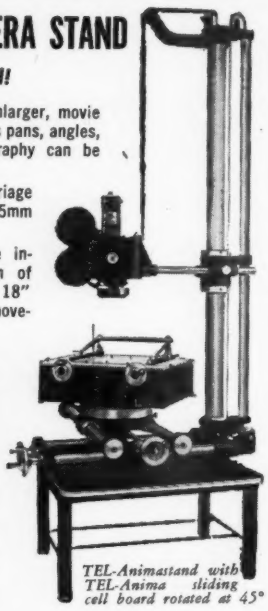

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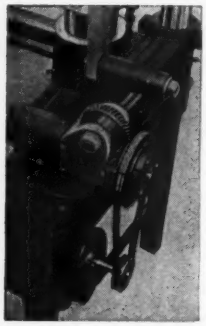

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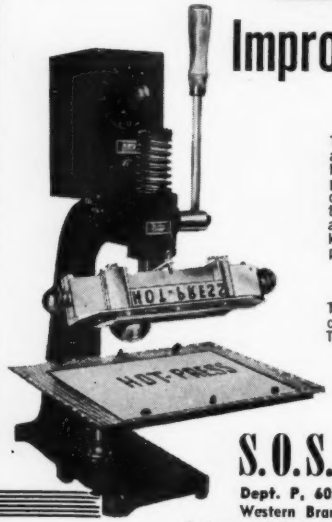

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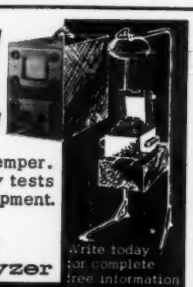

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MICROREPRODUCTION

(*continued from page* 28)

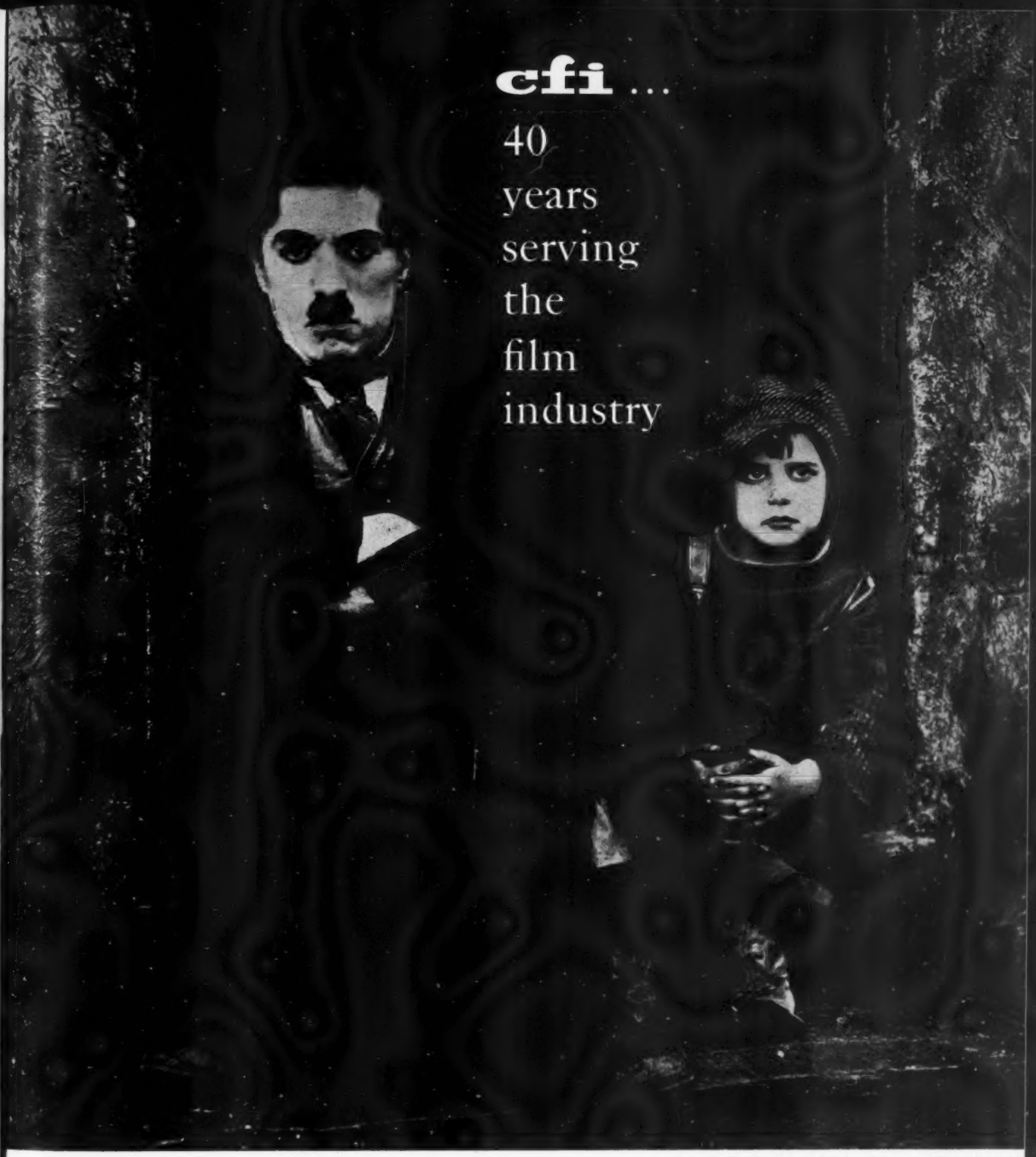
than those now commonly employed. Details may be found in Frederic Luthers' *Microphotography: A History. 1839-1900.* During World War II the "microdot" process used in espionage reduced a full legal size page of text to the dimensions of a single dot the size of a period made by a typewriter. Even today many of the processes used to make microdots remain classified. A good indication of methods that can be used will be found in G. W. W. Stevens' *Microphotography: Photography at Extreme Resolution*, of which incidentally it is understood that a new and revised edition is in process.

No one can know too much about the practical applications of ratios of reduction. What kind of originals will reduce how many diameters to produce a negative of specified characteristics? What are the effects of colored, aged, dirty or stained paper in combination with colored or faded inks and lead pencil, or the ball point pen of which it has been said that it will make ten carbon copies and no original? How will handwriting, typing, carbon copies, letter pressed copies reproduce? What effect will type size and face have on the problem of a proper microfilm reproduction? What films are best for particular needs? What kinds and values of lights or filters may be used? It is easy to ask these and many other similar questions. It is not so easy to come up with the right answers. Still the answers must be forthcoming. The technician must know them, for he will be required to do the work. The supervisor or executive should and the salesmen must know them, for otherwise they will be unable to function effectively. To the beginner, the amateur or the student practice and experimentation in this broad field can be instructive and enjoyable. There are few qualified and fully experienced specialists in the reproduction of documents of all types and their services are in considerable demand.

On film formats

Roll microfilms are made on 16, 35 and 70mm film widths. A new and rather specialized variation features 105mm but will be neglected for present purposes. The first two sizes were taken over directly from the motion picture industry in the early days of microfilming. At this point there were two distinct approaches to the field. Bank checks, card files and later business documentation

(*continued on page* 32)



Charlie Chaplin and Jackie Coogan in *The Kid*, 1921.

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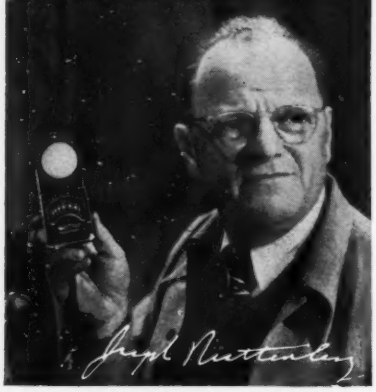

That's what Joseph Ruttenberg, A.S.C., who won an "Oscar" for filming "Gigi", thinks of his SPECTRA Professional Gold Seal Exposure Meter. He continues to say, "My *SPECTRA* instantly measures total illumination with a precision that insures correct balance for brilliant color films."

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Get more information. Circle 474, page 83

MICROREPRODUCTION

(*continued from page* 30)

generally were placed on 16mm film. The larger 35mm size was used for historical manuscripts, bound books, newspapers, census schedules and in due course engineering drawings. The 70mm width, also with a motion picture history and background was later adopted for engineering drawings and like purposes. The initial appeal of all of these sizes for microfilming lay in the availability of good quality cine film at low prices. The sizes themselves are something less than ideal. Geometrically the customary sizes of documentary originals do not always reduce to these widths to best advantage. Since microfilm does not run rapidly in precise alignment through machines, the cine perforations serve no purpose except perhaps to weaken the film. They were soon eliminated in America although in Europe perforated stock is still used to a great extent. As a practical matter the sizes are so well instrumented and standardized now that there is little possibility that they will be changed in the future.

There is no inherent technical limitation restricting any original to any size of film. As an extreme example, it would be possible to reproduce an engineering drawing 24 x 36 in. in size on 16mm microfilm so that it could be enlarged back to original size without noticeable loss in reading quality. The ability to enlarge a microfilm back to original size satisfactorily is a useful rule of thumb measure of quality. The cost of making such microfilms of engineering drawings would be prohibitive, but the work could be done. Cost therefore is an important, often controlling, factor in figuring ratio of reduction.

Two other closely related factors deserve attention. These are frame size, merely the area covered by the microfilm, and placement which relates to the positioning of the reading line in relation to the axis of the film.

In motion picture work it is essential to establish and maintain an exact frame size that is in precise relationship to the perforations on the edge of the film. The 35mm frame (old style) is 1 in. wide by ¾ in. high. The amateur 35mm still camera uses the "double frame" 1 in. wide and 1½ in. high. No such relationship is necessary for microfilming and some of the best cameras allow a variable frame size. The width is constant but the height of frame can be altered to fit the size of the docu-

(*continued on page* 78)

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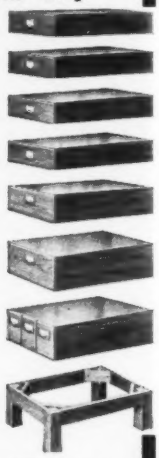

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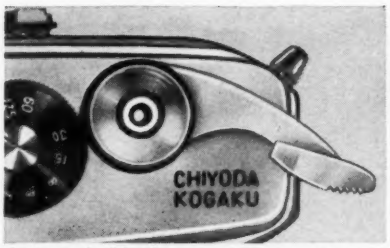
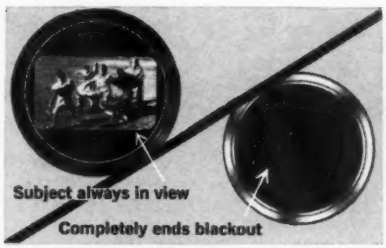
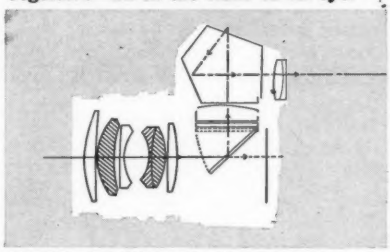


Automatic Diaphragm—Advance the single-throw, film-wind lever and the diaphragm opens to its largest opening; film advances; shutter is cocked, counter registers—all in the blink of an eye.



Instant Return Mirror—Press the shutter release and instantaneously diaphragm closes down to pre-selected aperture; mirror clears, film is exposed; mirror returns—blackout is entirely eliminated.

Standard lens—Automatic Rokkor f:1.8 —55 mm, 6 element. All lenses are ultra-precision crafted of rare earth, in platinum pots with a special double coating that eliminates the need for a UV filter.



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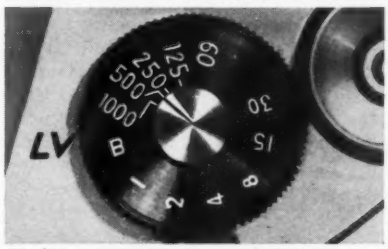

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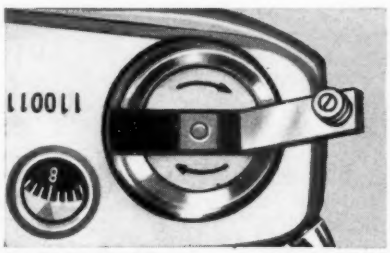
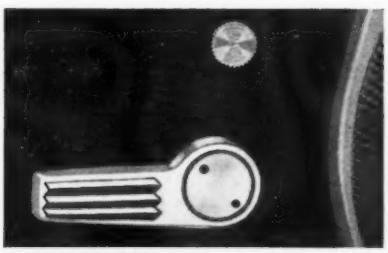


Rapid Rewind Crank... Magnified Exposure Counter... Automatic Zero Return.



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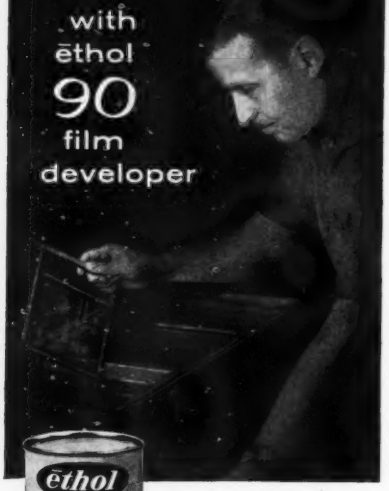

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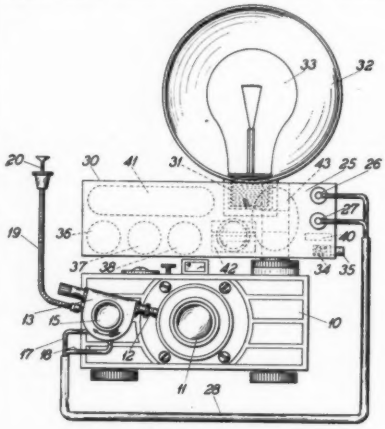
by Edward R. Farber

ELECTRONIC FLASH

The wink and how it works, light ranges, data book, other flashes

As a companion to its new film with an exposure index of 3000, Polaroid has announced a new electric flash unit they call the "Wink Light." It flashes an incandescent lamp in synchronization with the shutter. It gives enough light to serve as fill or supplementary illumination with such a fast emulsion.

The idea is not new, being similar to one described in a patent filed in February, 1939, by R. P. Wuerfel. The patent was issued in 1942 and assigned to International Industries, the original manufacturers of the Argus camera. I do not believe the product was ever put on the market, but if you write for patent No. 2,290,264 and send 25¢ the Patent



R. P. Wuerfel's patent

Office will send you a copy with detailed enough description to build your own.

The inventor described the device as a sort of an instant photoflood: "[The] flash unit [is] adapted to utilize a conventional electric bulb which may be utilized a number of times rather than the single flash at present permitted of a flashbulb. . . . [the unit provides] means to control an electrolytic condenser [and] to charge the same to permit imparting an overload to a conventional electric bulb to produce a flash therefrom."

Northland news

Last week Don Mohler of the GE Photolamp Department came up to the north woods to meet with Wisconsin Press Photographers at the paper industries Trees for Tomorrow camp in Eagle River, Wis.

During the 400 mile drive we meditated on the problems of lighting and the tremendous range of light intensities we work with in everyday exposures. It reminded me of my favorite illustration to explain why studio Strobe equipment got so big and heavy. If a certain exposure is correct with a 50-watt-second unit at f/2 how many such 50 watt-second units are required for you to stop down to f/64?

The answer is 1024 50-watt-second units—or 51,200-watt-seconds total. (See illustration *below.*)

Now, said Don, just to shock yourself a little more, figure out how many 100-watt lamps it would take to properly expose a photograph at 1/1024 sec. at f/64 if it took one 100-watt lamp to give a proper exposure at f/2 with a 1 sec. shutter speed. You figure that yourself.

Films for 35mm speedlight seemed to be among the live issues at the camp's beer bull sessions. Carmie Thompson of the Madison, Wisc. *Capital Times* felt he was getting exceptional results with Panatomic-X —almost equal to Plus-X in emulsion speed and much better in other respects such as grain and gradation in his opinion. He has a mimeographed chart on his film and developer recommendations for 35mm users. You can have it for a stamped return envelope.

(*continued on page* 36)

F-NUMBER										
2	2.8	4	5.6	8	11	16	22	32	45	64
1	2	4	8	16	32	64	128	256	512	1024
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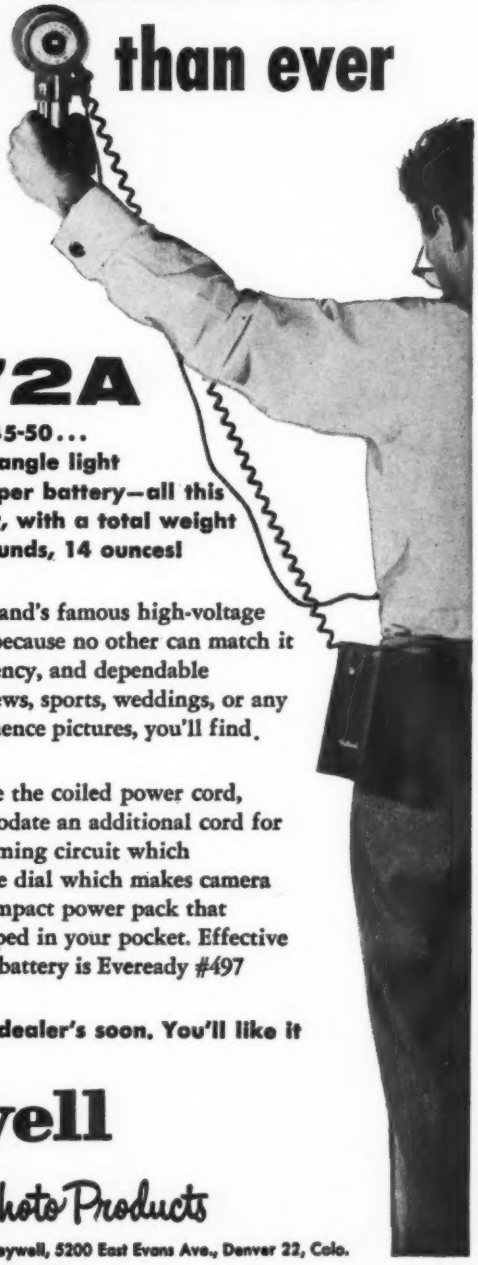
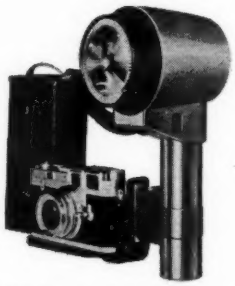
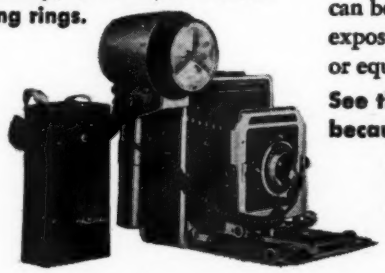


the all new Heiland STROBONAR 72A



The 72A can be mounted on virtually all cameras by choosing the proper Heiland brackets and shutter cords. It accepts the Heiland Model E Clamp, Quick-Release Clamp, or Graflex mounting rings.



Kodachrome guide number of 45-50... 2-6 second cycling...70° wide-angle light distribution... 600-800 flashes per battery—all this in a smaller package than ever, with a total weight (*including* battery) of only 3 pounds, 14 ounces! That's the new Strobonar 72A.

Here's a unit designed around Heiland's famous high-voltage system, preferred by professionals because no other can match it for quick cycling, maximum efficiency, and dependable service. If you shoot fast-moving news, sports, weddings, or any other event that calls for rapid-sequence pictures, you'll find the 72A in a class by itself.

Other features you'll appreciate are the coiled power cord, detachable at *both* ends to accommodate an additional cord for extension; the special capacitor-forming circuit which adds battery life; the large exposure dial which makes camera settings quick and easy; and the compact power pack that can be snapped to your belt or slipped in your pocket. Effective exposure time is 1/1000 sec.; 510 v battery is Eveready #497 or equivalent.

See the Strobonar 72A at your dealer's soon. You'll like it because it's made for *you*.

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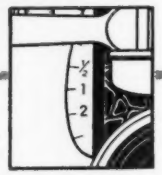

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Get more information. Circle 460, page 83

ELECTRONIC FLASH

(*continued from page* 34)

Panatomic-X is particularly useful for very short duration exposures when reciprocity failure results in loss of contrast with high speed pan films. Try it for a surprise.

Flash tube data

General Electric has just released its new *Flashtube Data Manual*. This is unquestionably the finest collection of engineering information available on electronic flash.

It includes basic circuit diagrams, step-by-step design information, stroboscopic uses, signal lights, lamp data, and a bibliography. It is recommended reading even if the formulas are not part of your vocabulary. Your own engineering department or the neighborhood ham radio operator can help you over the tough spots and sooner or later the background will help you solve one of those "impossible" photographic problems.

Write on your letterhead for *Flashtube Data Manual*, Photolamp Department No. 281 General Electric Company, Cleveland 12, Ohio.

What next?

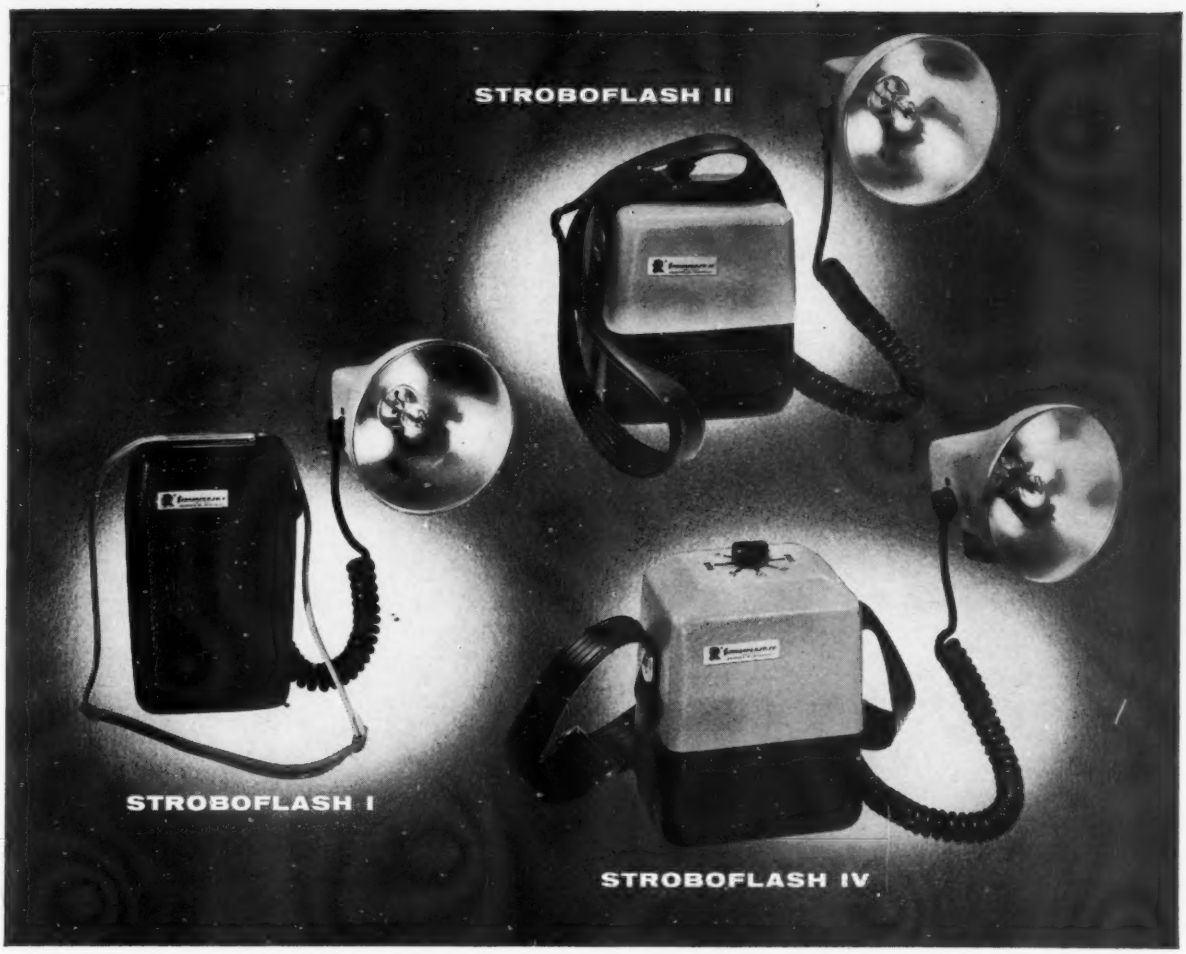
A recent SPSE lecturer, pointing out the merits of video tape and the extraordinary emulsion speed of the image orthicon television camera, commented that we have in effect, a faithful live-TV memory with an equivalent ASA exposure index of 2500 or more.

This has given rise to visions of photogs with creepy peepys pointing their cameras this way and that, with tapes edited by picture editors who by the push of a button translate what they see into a print on the LogEtronic enlarger or an engraving on the Scan-A-Graver.

The industrial protographer can take heart, however. There is no immediate likelihood of high-speed movies or stills being taken from video sources. The information is just not there on the tape. TV still has to take a long look. High frame rates are still well in the future.

The pendulum they say, always swings the other way. But the following suggestion concerns only the downbeat.

A simple way to make a consistent interval timer is with a weight on string which, when released, swings in its natural arc closing contacts, which can first open a shutter, then flash a sequence of flash lamps and finally close a shutter. Remember that the time of vibration is dependent on the length of the string.—THE END



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STROBOFLASH II is a rugged, all-purpose portable which withstands rough handling and hard use. Designed for and used by professionals and advanced photographers. 100 watt sec. Less batteries, only $99.50. Photo Tube accessory kit provides "slave" operation, only $9.90.

STROBOFLASH IV, by means of its 4-way power selector, permits variance of exposure without changing f number. The ultimate in electronic flash. 200 watt sec. Less batteries, only $165.95. Photo Tube accessory kit provides "slave" operation, only $9.90.

For complete information on Stroboflash units see your Graflex dealer or write Dept. PMI-109, Graflex, Inc., Rochester 3, N. Y. A Subsidiary of General Precision Equipment Corporation.

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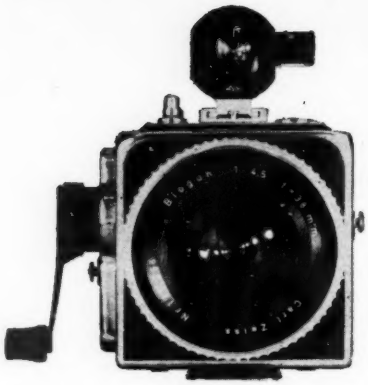
Get more information. Circle 440, page 83

This is the new Hasselblad Super Wide C – the only 2¼×2¼ camera that gives an extreme picture angle of 90° with edge-to-edge sharpness.

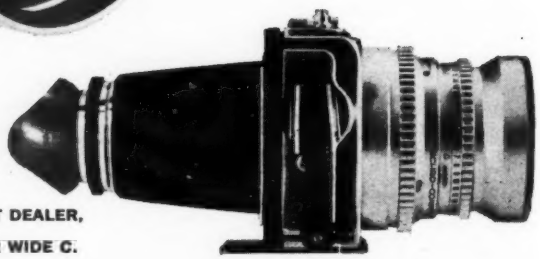
The lens is a Zeiss Biogon 4,5/38 mm with built-in Synchro-Compur shutter, speeds B, 1–1/500 sec., exposure values and automatic depth-of-field indicators, full M and X synchronisation. Focusing range from 12 inches to infinity.

Top release • built-in spirit level • quick-action attachment • rapid winding crank • and as all other Hasselblad cameras interchangeable roll-film magazines.



HASSELBLAD

Hasselblad Super Wide C gives your pictures that extra certain "something". Ideal for architects, engineers, reporters and amateurs, seeking pictures with improved perspective. When taking interior shots the ground glass adapter can be combined with a magnifying hood providing effective focusing control.



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AN EDITORIAL

TIME TO COME UP FOR AIR

Photography as a profession, to put it nicely, is damn hard work. While not every assignment demands that the photographer hang his camera strap in his teeth and climb 385 rungs to the top of the plant water tower—in this creative medium you sweat it out almost as much as you think it out. Each picture is a demanding, exacting challenge for the photographer who rates the title "professional," Industrial work, furthermore, presents these challenges one upon the next as fast or faster than the photographer can keep up with them.

So it is that the pressure is to think only from picture to picture. It's a trap. If you are one of the industrial photographers who have fallen into it, we exhort you to stop and come up for air. While you are taking a breather, see where you've been and where you're going. We suggest also that you take a look at the drift of industrial work.

Years ago a professional was necessary simply to assure that the picture would "come out." This is no longer true. In fact, to ease their load and make more and better use of photography, many industrial units are equipping non-photographic personnel with "idiot-proof" cameras for strictly routine documentary work. Today the industrial photographer is needed for more—much more—than his limited original purpose. From direct color murals to electron-cine-micrography the applications of photography in industry have expanded so much in the last generation that there is no comparison. The question for the industrial photographer is: how much of what photography offers industry do we offer our organization?

The Editors

TONE REPRODUCTION

• Time was when all works i visual arts were evaluated ac cording to how closely they con veyed an impression of nature objects. But artists working wit non-photographic media lon since abandoned this as a nece sary criterion, and for som years many of their productions have shown no correspondence whatsoever to physical subject Photographers, on the other hand, by the very nature of the photographic process, have had to tak a different stand. Despite wide differences of opinion as to what constitutes a good photograph many of its particulars there has been consistent agreement that a visual correlation of one sort o

DEFINITION

Notwithstanding the universal agreement among photographers that scenes and reproductions should bear a definite visual resemblance, only a small minority has considered the possible merits and applications of techniques that would lead to perfect tone reproduction in photographs. It is not surprising, though, that the bulk of photographers have little interest in technical perfection, *per se*, when their results are judged by aesthetic, rather than technical, values. Most photographers say that they strive for technical perfection whenever it is called for, but they are unaware of the looseness with which they use this expression.

Good tone reproduction in a photograph represents but one element of a technically perfect reproduction, but it is a most important one, whether we refer to black-and-white or color photography. In this article the discussion is restricted to black-and-white photography where tone reproduction is of greatest importance.

To define in a qualitative sense what is meant by tone reproduction it is perhaps best to consider first a typical scene and its reproduction rather than a special case such as the reproduction of a grey scale.

Any one element of a scene reflects light to our eyes according to the amount of light falling on it and its reflection characteristics. Ignoring the possible existence of light *sources* in the scene, our visual evaluation of the total scene depends largely upon the complex pattern of physical light quantities reflected from its numerous elements. But this dependence is not as straightforward as often thought, because our visual system itself introduces certain complications that preclude a one-to-one relationship between physical light quantities (luminances) and what we see (brightnesses). These complications will be dealt with later. For the moment let us assume that what we see when viewing a scene is directly related to its luminance pattern.

Suppose our typical scene were photographed on a negative material having appropriate gradation characteristics and that the development of the film resulted in a negative with a density range suitable for printing onto a normal grade of photographic paper. In other words, we produce a photographic reproduction of the scene with the most suitable materials available, following sound principles of technique. The question now is: would the density pattern of the reproduction elicit the same visual impression as the luminance pattern of the original scene? If so, we should have accomplished perfect tone reproduction. That is, the print densities would reflect the same amounts of light to our eyes as were reflected from corresponding elements of the scene. (But it never happens.)

This, then, is what is meant by tone reproduction in the basic sense. But it cannot be stressed too strongly that this explanation is loose and has pitfalls galore. We must now inquire further into the problem, eliminating as far as possible assumptions that are not supported by actual observations.

A SIMPLE CASE

If we consider a less complex subject than an outdoor scene, and therefore a less involved problem of tone reproduction, we shall be able to see that perfect tone reproduction is possible in restricted cases. For this purpose a continuous grey wedge is admirably suited.

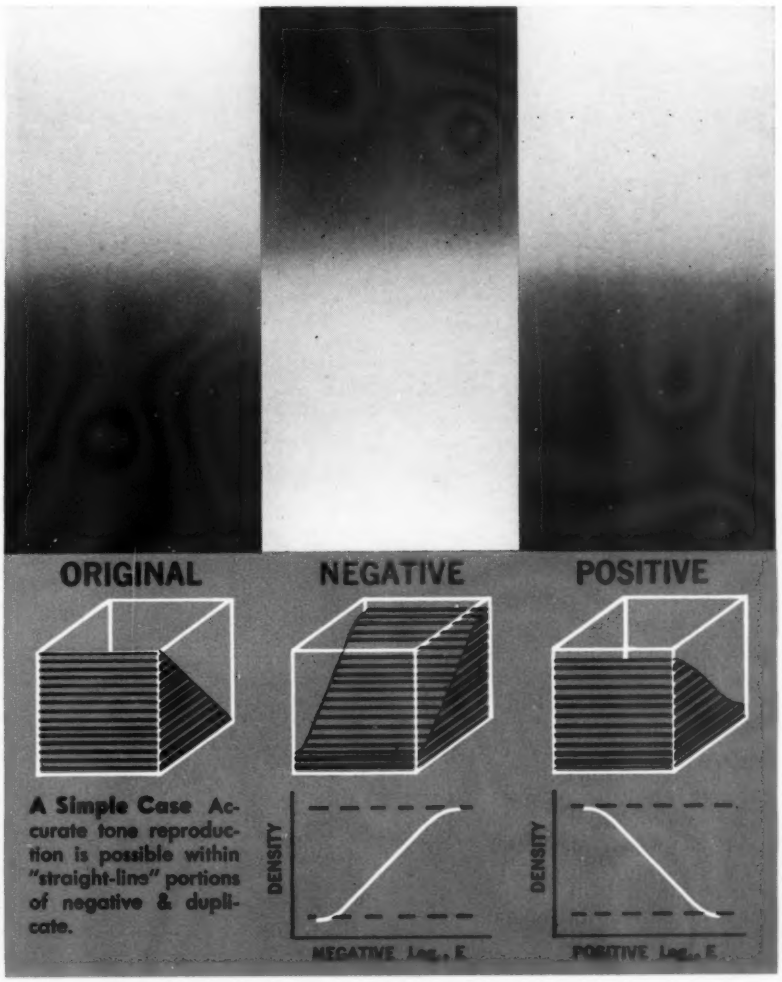
In the figure the original grey wedge "subject" is shown schematically, both in perspective and as the wedge appears when illuminated from one side. The optical *density* of the wedge varies continuously from one end to the other, therefore, when uniformly illuminated from one side the light transmitted through the wedge varies *logarithmically* from one end to the other. Thus, when placed in contact with a negative film material and an exposure made, the emulsion will receive a logarithmic scale of exposures. Upon development the densities of the film can be plotted against the corresponding

another must exist between the reproduction and the original subject or scene. Now the extent to which this correlation should approach perfection has been a subject of considerable contention throughout the history of photography. Adequate evidence is found in pictorial annuals, picture collections and the printed literature to show that the aesthetic concepts of photographers have changed markedly from time to time. In a very early era it was generally assumed, albeit erroneously, that photographs were perfect reproductions of scenes or subjects, except for size, color and depth consideration. Later on a high degree of perfection in photographs was considered poor taste and all manner of procedures were introduced to distort the tone reproduction and other capabilities inherent in the photographic process when carried out in its simplest form. Recently a reversion to photographic realism has developed which permits distortions in the relationship between subject and reproduction characteristics if only photographic procedures are employed.

by Lloyd E. Varden

exposures effected by the wedge. (These will actually be relative log exposures and not absolute values, but this makes no difference because we are interested only in showing the shape of the D-Log E curve.)

As discussed in a previous article ("The Graphs No One Knows How to Read," PMI, March, 1958, 48-51) the D-Log E curve of a film material exhibits a non-linear toe and shoulder region in addition to a central linear region. The degree of non-linearity in the toe and shoulder regions and the length of the straight-line portion of the curve vary considerably from film to film. But it is obvious that for perfect tone reproduction of the wedge only the straight-line portions of the recording materials are useful. The horizontal dotted lines indicate the density range within which the wedge densities will be linearly reproduced. The exposure of the original onto the negative has to be adjusted so that a maximum range of densities will fall within this straight-line region. The same thing applies when exposing the negative onto a second film for producing the final positive image. If the negative and positive films are both developed to a gamma of 1.0, the wedge densities will be perfectly reproduced within the straight-line region. A gamma of 1.0 means that along the straight-line portion of the D-Log E curve the densities increase at the same



A Simple Case Accurate tone reproduction is possible within "straight-lins" portions of negative & duplicate.

rate as the log exposures increase. If the densities increase at a lower rate the gamma will be less than 1.0; at a higher rate more than 1.0. An error in developing the negative film can be corrected when processing the positive film, because a linear reproduction of the original wedge results when the *product* of the negative and positive gammas equals 1.0.

Some negative films have such a short straight-line in their D-Log E curves that they are practically useless for perfect tone reproduction of density wedges and similar subjects which require a high order of accuracy. Non-linearities in the D-Log E curve of the negative material are not readily corrected in exposing and processing the positive. (With special materials some correction can be introduced, as we shall discuss later.) For this reason manufacturers nearly always retain in their range of films certain types which have especially long straight-line regions over a considerable exposure range, and these films are invariably recommended where excellence of tone reproduction is essential, e.g., in producing tri-color separation negatives, etc.

FLARE

You have probably already made a mental note that in outlining this "simple case" of tone reproduction no mention was made of a camera. But if contact exposures had not been employed throughout, the example would no longer have been truly simple. Once a camera is introduced the difficulties of tone reproduction are increased because of distortions caused by flare light. (See "The Optical Personality of the Process Lens," PMI, June, 1958, 44-48 for a complete discussion.) In general it can be considered as a uniform veil of unwanted or non-image light falling upon the focal plane of the camera. Its effects are to reduce the over-all luminance range and, because it has progressively greater influence from the high to lower luminance levels, to cause the transfer of image light to be non-linear. For example, a luminance range of 1:100 is reduced to a range of approximately 1:50 by one unit of flare light because by adding 1.0 to both ends of the range it becomes 2:101, or roughly 1:50. But in the range of 1:10 one unit of flare light causes a greater change than it does in the range of 90:100. In the first instance, the range becomes 1:5.5, whereas in the second instance there is practically no change at all. (90:100 represents a range of 1:1.1111, whereas 91:101 represents a range of approximately 1:1.1099.

A FALLACY

Despite the insistence in previous paragraphs that perfect tone reproduction of a continuous wedge through a limited density range could not be accomplished except within the straight-line portions of the D-Log E curves of the negative and positive film materials, it is not generally true that the straight-line of the negative material leads to optimum tone reproduction. The reason for this is simply that in most photography the end product is a paper print, which changes the tone reproduction problem altogether.

Nevertheless, it was thought for many years that best tone reproduction could not be obtained unless all the negative exposures fell within the straight-line portion of the D-Log E curve. No doubt this concept originated from the early writings of Hurter and Driffield. In 1890 they stated the following:

"The production of a perfect picture by means of photography is an art; the production of a technically perfect negative is a science.

"A perfect negative demands, in the first place, a perfect plate, and as the manufacture of dry sensitive plates is a large and rapidly-growing chemical industry, we need offer no apology for bringing this subject before the Society.

"Our researches, which have covered a period of over ten years, were made with a view to rendering the production of perfect negatives as far as possible a matter of certainty.

"What is a perfect negative? A negative is theoretically perfect when the amount of light transmitted through its various gradations is in inverse ratio to that which the corresponding parts of the original subject sent out.

"The negative is mathematically the true inverse of the original when the opacities of its gradations are proportional to the light reflected by those parts of the original which they represent."

Certainly these statements would be correct if the end product of photography was a film negative. But since negatives are only intermediates in the production of paper prints—with few exceptions—we have to consider tone reproduction on the basis of the total process.

Photographic papers have such a limited density range that it behooves us to use the full range for best quality prints. The whites of even unexposed areas of a paper do not reflect 100 per cent of the incident light and the maximum blacks of heavily exposed areas rarely reach a density of 2.0. The total density range in the best of prints, from highlights to deepest shadows, is of the order of 1.7 or 1.8. To utilize the total density range of photographic papers the toe and shoulder regions cannot be avoided. As a general rule the toe densities extend up to about 0.5 and the shoulder densities are those above about 1.5. These values vary according to the type of paper, contrast grade, surface characteristics, etc. In any case there is no photographic paper which has an appreciably long straight-line portion in its D-Log E curve, and in some instances there is no true straight-line at all.

When we consider the tone reproduction of a subject as recorded in a negative in relation to the D-Log E curve of a printing paper, we find that the over-all tone reproduction of the final print is improved if the shadow areas of the subject are represented by densities well into the toe region of the film material. The reason for this is best explained by a tone reproduction plot.

PLOTTING ACCURACY

Several methods for plotting tone reproduction graphs have been suggested, but the most widely

used one is that devised by the late Lloyd Jones. Originally it was referred to as the quadrant method and this designation is still satisfactory in most instances if only objective factors are considered. As we shall see later, however, a more complete picture of tone reproduction involves a number of subjective and other factors. More than four areas (quadrants) are needed to get them all in, and so Jones later used the term "block".

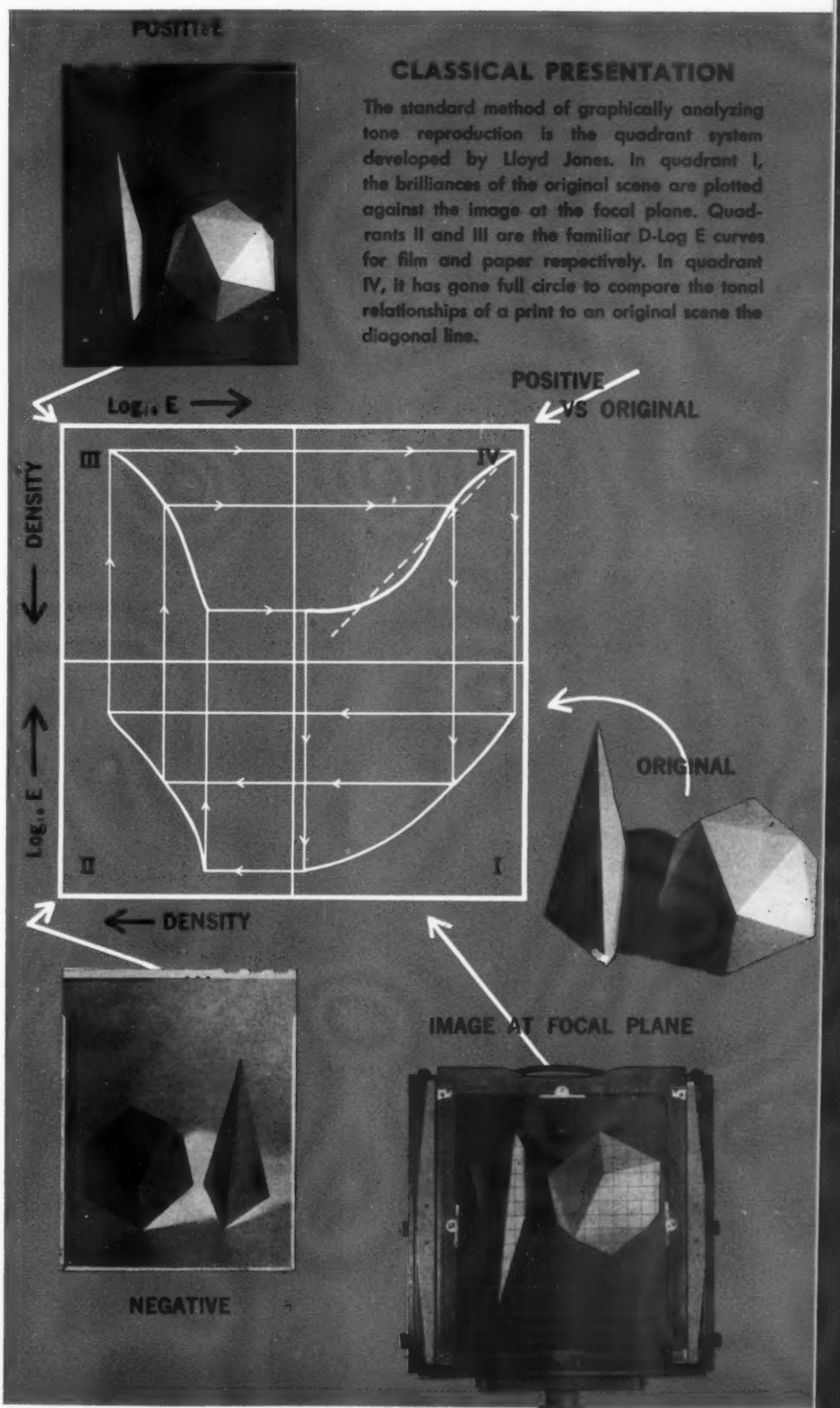
The figure shows a typical tone reproduction plot. In Quadrant I the subject luminances (in log values) are plotted as received at the image plane of the camera. This line would be straight and at a 45° angle if flare did not distort the transfer of the subject luminances.

In Quadrant II, the D-Log E curve of the negative material for a given degree of development is shown, rotated 90° from the usual way of displaying such curves. Points along the curve in I are connected by horizontal straight lines to points along the D-Log E curve of the film, indicating the progression of densities produced by the camera exposure.

In Quadrant III the D-Log E curve of the printing paper is drawn with the maximum density in the lower right corner and minimum density in the upper left. If the page is turned around you will note that the curve is drawn in the positive form. Lines are projected upward from the points on the D-Log E curve of the film until they intersect with the paper curve. The log exposure values for the paper curve run from left to right. Thus, the minimum density in the negative corresponds to the maximum exposure point for the paper, etc.

Quadrant IV gives the objective tone reproduction curve. It is formed by placing points at the intersections of lines drawn from Quadrants I and III, and then connecting the points. If the objective tone reproduction were perfect all points would fall along the straight line shown in this quadrant. In this instance the tone reproduction curve shows that the shadow tones of the subject have been reproduced too flat in contrast and the middletones and highlights too steep in contrast.

The quadrant method for determining objective tone reproduction


CLASSICAL PRESENTATION
The standard method of graphically analyzing tone reproduction is the quadrant system developed by Lloyd Jones. In quadrant I, the brilliances of the original scene are plotted against the image at the focal plane. Quadrants II and III are the familiar D-Log E curves for film and paper respectively. In quadrant IV, it has gone full circle to compare the tonal relationships of a print to an original scene the diagonal line.
POSITIVE
VS ORIGINAL
Log E
DENSITY
III
IV
II
I
Log E
DENSITY
ORIGINAL
IMAGE AT FOCAL PLANE
NEGATIVE

accuracy does not have much application for original photography. Many other factors beyond the objective phase of tone reproduction have to be taken into account. However, this method is quite useful for determining the most suitable materials and procedures for copying purposes. Industrial photographers know only too well the difficulties in copying photographs, etc., so that the reproductions do not look like copies. Tone reproduction plots readily show the reasons. The most objectionable fault in most copies is flat highlight gradation which, until recently, was almost unavoidable. Special films have been introduced (Kodak Gravure Copy Film and Gevaert Correctone Film) that greatly help in overcoming this problem. A D-Log E curve which typifies the sensitometric characteristics of these films is shown. The "shoulder" turns upward instead of flattening off, giving increased highlight contrast in the copy negative, which in turn avoids the lack of highlight contrast in the copy print.

MASKING AND FLASHING

It should be evident by now that tone reproduction is considerably more involved than merely applying the old rule of selecting a paper whose log exposure scale corresponds to the density scale of the negative. This is essential, of course, if detail is to be reproduced in a print from both ends of the negative scale. When this is not possible various procedures can be used to bring about a proper fit, but it cannot be said that this will always lead to improved tone reproduction in comparison to that obtainable by straightforward methods. Masking negatives to reduce their density scale or flashing photographic paper before exposure to a negative to alter its normal contrast characteristics are useful procedures when circumstances demand them, but it is doubtful if tone reproduction as such is brought closer to perfection.

LOGETRONICS

The LogEtronics cathode-ray tube scanning system for exposing prints has become so well known that it requires no explanation here. It is without question the most successful method for normalizing neg-

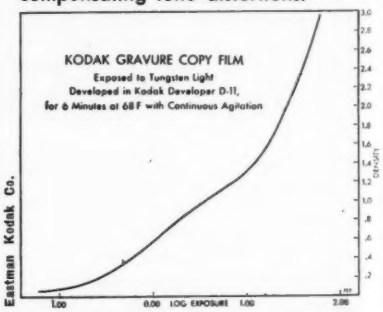
Meyers Printing Co.

Automatic masking of shadow areas is provided in an old system, red printing out proof, as the shadows darken they "hold back" exposure.

Comparison print, also a contact print, reveals lack of masking—little or no detail in the blocked up highlights of the negative.

Gevaert Co. of America, Inc.

Two-layer film, Gevaert Correctone, has high and low contrast layers for compensating tone distortions.


KODAK GRAVURE COPY FILM
Exposed to Tungsten Light
Developed in Kodak Developer D-11,
for 6 Minutes at 68 F with Continuous Agitation
LOG EXPOSURE
DENSITY

Eastman Kodak Co.

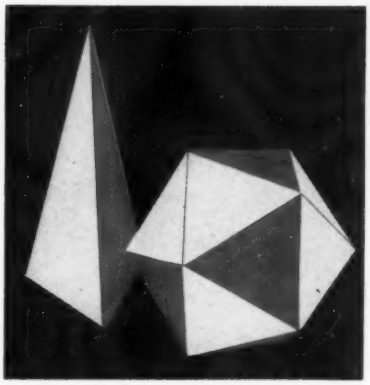
Unusual curve of continuous-tone copy film has steep highlight portion to counteract normal greying of highlights in reproduction.

atives whose contrast and density characteristics is different local areas require different printing paper contrasts and print exposures. It is difficult to say exactly how much this system alters the tone reproduction capacity of the photographic process because to my knowledge no data have been published on the subject. But the method leads to great improvement in print detail when negatives have too wide a density scale for normal printing. Such negatives often have different local contrasts, also, which the scanning method can correct. However, in terms of original subjects it could happen that Log-Etronic prints sometimes represent an exaggeration which, although more acceptable perhaps to a customer, may still exhibit poor tone reproduction characteristics. For example, if you photograph an open landscape on a clear moonlight night and give a sufficiently long exposure, a print from the negative can be made that appears as though the photograph were taken in the daytime. This might serve some particular purpose, but it would not be a good example of outstanding tone reproduction, because for this, the print would at least have to appear as a moonlit scene.

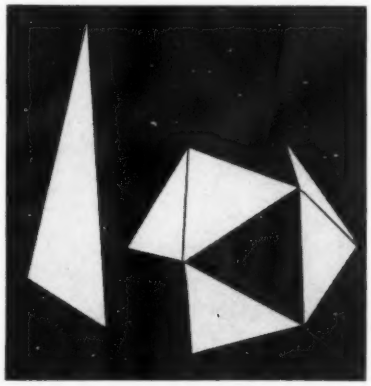
MULTICOLORED SUBJECTS

Reference has already been made to subjective factors in tone reproduction. One of these should be introduced here before considering the broader aspects of the subject because it is somewhat of a misfit.

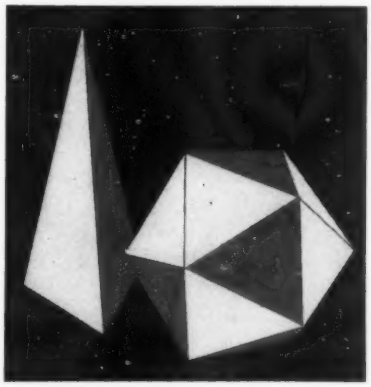
Tone reproduction in a strict sense is concerned only with the brightness aspects of a scene. The scene may contain a multitude of colored objects, plus neutrals, but we deal only with the brightness attribute of these objects in tone reproduction—not the hue of the colors or their saturation. This is disturbing when one tries to rationalize the value of good tone reproduction with visual experience. When two objects look distinctly different by virtue of contrast we want them to be represented in prints as different densities. But what happens when two or more colors in a scene have equal brightness, especially if they are adjacent to each other? According to the dictates of tone reproduction theory these colors should be reproduced as equal densities in prints. Now the hues of these colors (or differences in saturation of the same hue) produce a visual contrast that we cannot ignore. Yet in a print of excellent tone reproduction these colors would appear as though they were one and the same because they do not differ in brightness. This is an unsatisfactory situation and is generally not acceptable even to those who stress the importance of striving for perfect tone reproduction.



COLORED ORIGINAL This original has color which is intended to be a visual match for the darkness of background grey.



"CORRECT" COPY A "perfect" black-and-white film renders color as a grey to match darkness of original colored portions.



DISTORTED COPY In this copy film with filter renders color as a light grey. Distortion is improvement over "correct" copy.

The three illustrations make this point clear. The left object consists of three strongly contrasting colors of the same visual brightness. The reproduction of the object on the right shows little contrast between the Greek letters, the background and the band. Such a reproduction would be slapped back to the photographer for another try and no amount of argument about tone reproduction would be convincing.

SUBJECTIVE FACTORS

Photographic films are a different breed of animal from human vision. A film responds in a more-or-less invariable way to specific quantities of light energy, whereas the relationship of light quantity (luminance) and our interpretation of it (brightness) is not at all rigid.

For example, the visual system adapts itself over an extremely wide range of illumination levels in an effort to make the world around us appear pretty much the same at all times. The adaptation mechanism is not perfect by any means and at very low and high levels of illumination the characteristics of our vision are decidedly different from normal. But under the usually encountered light levels of daylight the eye (and brain) do a remarkable adaptation job. What we see under these conditions bears little direct relationship to absolute luminance values. When daylight becomes stronger our visual system rapidly loses sensitivity and when the light level drops it gains sensitivity. Photographic films have no such ability. As a result the theory, and especially the practice, of tone reproduction is made more complicated. (*continued on page 87*)

Photo Department Analysis No. 18

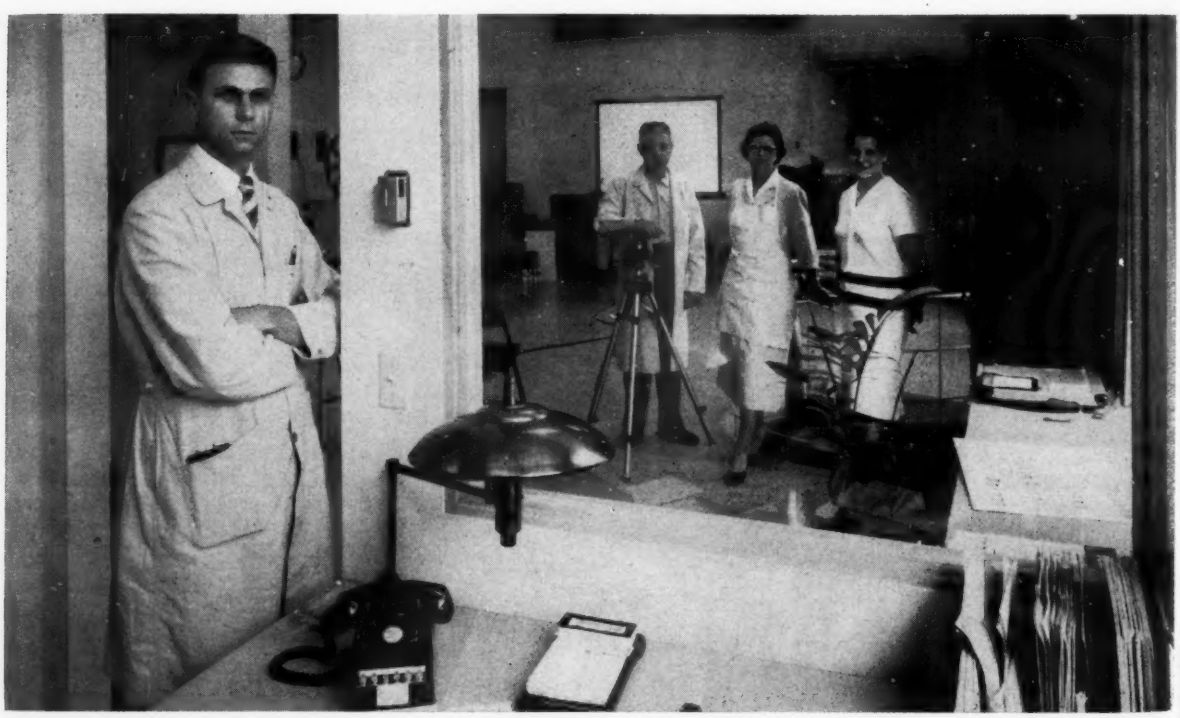
S.C.JOHNSON & SON

When there are only two photographers in a section, specialized prima donnas are an extravagance. At S. C. Johnson, the emphasis is on day-to-day dependability on a wide variety of bread-and-butter assignments.

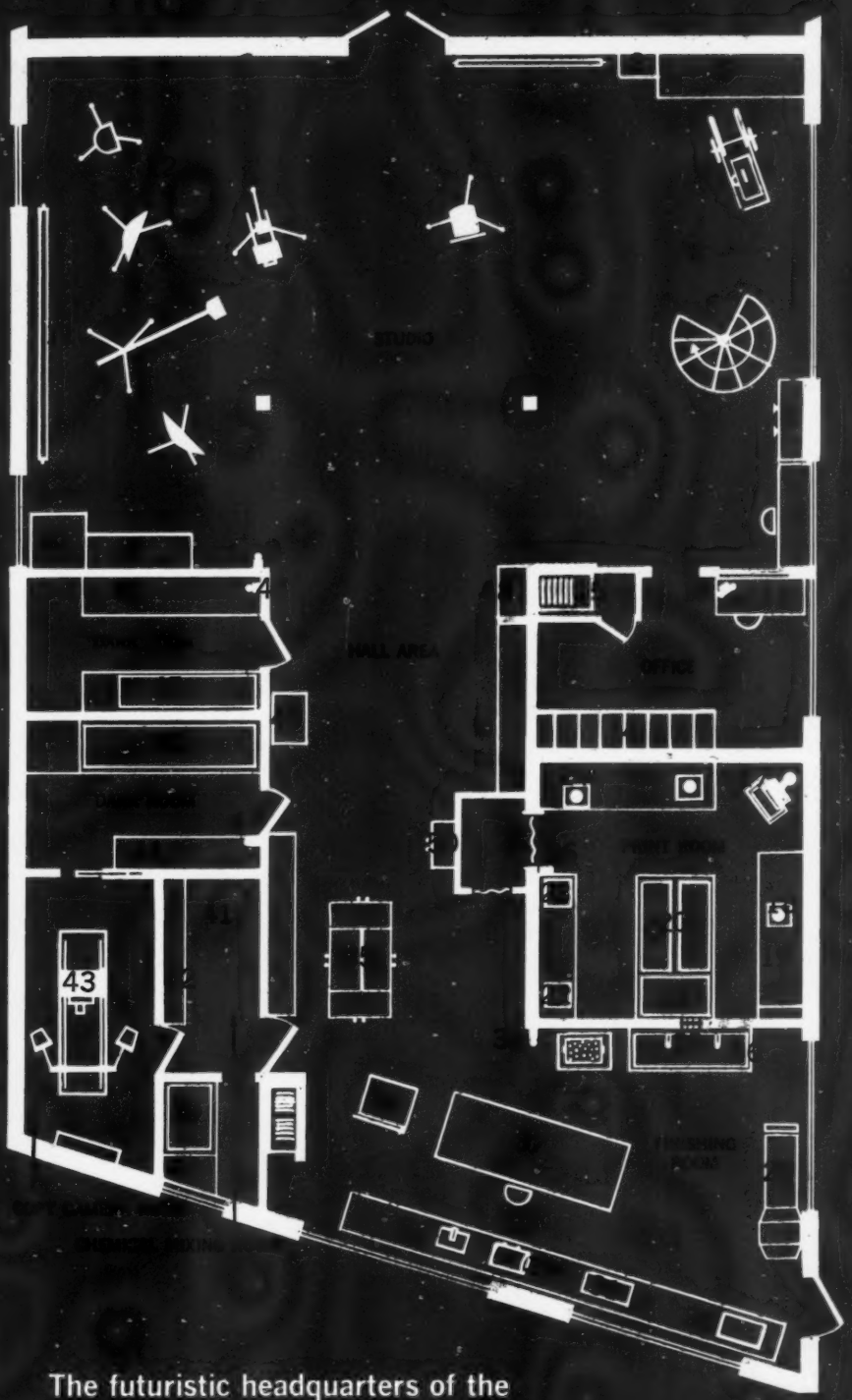
When Frank Lloyd Wright designed the Administration Building and the Research and Development Tower at S. C. Johnson, the Racine wax works, it is doubtful if he had any idea that his work would furnish the Johnson photo section with their most popular subjects. Some 5000 negatives are on file showing the buildings in every stage and from every angle.

But despite the emphasis on architecture, the photo section at S. C. Johnson is basically an industrial section, turning out the various pictures which are needed in any modern plant. From a sales award to the development of a new process, from an executive portrait to a new package design, the four-man team, two of whom are women, turn out a variety of high quality work.

Headed by Al Krescanko, the staff includes photographer Omer Bass, lab technician Eleanor Zore and secretary Joanne Novak. Organizationally under the advertising department, the photo section is housed in new quarters, the result of a recent expansion program, containing 2,800 ft. of



S. C. Johnson photo department is headed by Al Krescanko *(extreme left)* aided and abetted by (in the usual order) photographer Omer Bass, photo finisher Eleanor Zore and secretary Joanne Novak who helps in the lab on rush print orders. Background is studio area, visible through glass partition of photo section office.



STUDIO

1 Background paper rolls 2 Colored cardboard background material 3 Storage 4 Movable cart 5 Circular stairway 6 Coat closet 7 Desk 8 Telephone 9 Storage 10 Editing bench 11 Seamless paper on sky-drop 12 Studio lights

OFFICE

13 Desk 14 Filing cabinets 15 Room air conditioner 16 Telephone

PRINT ROOM

17 Elwood cold light 8 x 10 enlarger 18 Omega 4 x 5 enlarger 19 Table 20 Sink 21 Hypo tank 22 Morse contact printer 23 Photostat printer 24 Autofocus 5 x 7 enlarger 25 Curtain 26 Telephone

FINISHING ROOM

27 Pakolux print washer 28 Pass-through slot for pictures 29 Pako print dryer 30 Light box 31 Cox headliner 32 Burke & James matte print dryer 33 Seal, Inc. dry-mount press 34 Large paper cutter 35 Paper and film storage cabinets 36 Sink 37 Table 38 Telephone

CHEMICAL MIXING ROOM

39 Sink 40 Formica shelf 41 Chemical storage 42 Cabinets

COPY CAMERA ROOM

43 Robertson seventeen camera

DARK ROOMS

44 Table 45 Sink 46 Cabinets 47 Telephone

HALL AREA

48 Refrigerator 49 Pako dry-lab film dryer 50 Cabinets

The futuristic headquarters of the makers of Johnson's wax contain this layout for a four-man photo department's still, motion picture and graphic arts activities

air-conditioned working area.

This space is divided into two darkrooms, a printing and enlarging room, a chemical storage and mixing room, print finishing section, office and studio area.

The equipment is planned to give the maximum versatility to the section, the list including three 4 x 5 Graphics, a 4 x 5 Linhof, a 4 x 5 Kodak View with wide-angle, 5, 7½, 8 and 9-in. lenses, an 8 x 10 Deardorff View with wide-angle, 12, 14 and 17½-in. lenses, plus three Leicas with lenses for 35mm work. Movie assignments are handled with a Kodak Cine Special and a Bell & Howell 16mm electric eye camera. For the occasional odd job and for loan to other departments for photo use away from the plant, there is a Minolta Reflex. Electronic flash equipment includes Ascor, Heiland and Stroboflash lighting units.

Outboard motor carrier adapted as carryall to hold equipment on location work.

About 40 per cent of the work load is concerned with the company's employee publications, the weekly newspaper and a 20-page quarterly. The paper is printed at the company printing plant using multilith, with the photo section supplying negatives of both photo and type-set copy. Negatives for publication are made with a 120 line magenta screen. No special systems are used, instructions on offset work having been furnished by Robertson Camera technicians. The range of offset work covers business forms, letterheads, the company phone book and various booklets and programs.

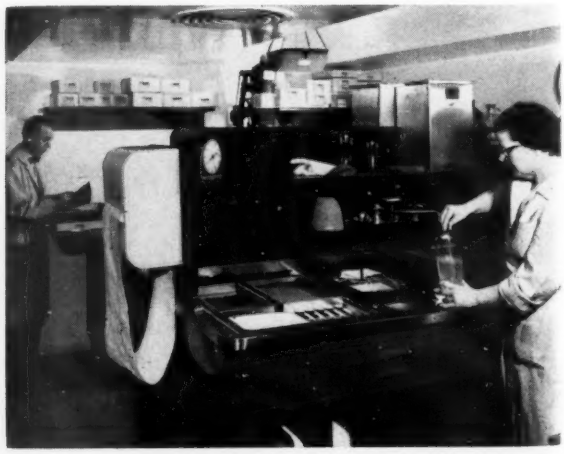
A further 30 per cent of the assignments involve the preparation of display and point-of-sale material, sales brochures and mailing pieces. This work frequently requires color pictures of product containers or merchandising displays.

For color work, Anscochrome, Ektachrome or Ektacolor is used, depending upon the assignment. Processing is done by an outside processor.

Perhaps the busiest days for the photo section occur when the star of one of the company's television programs visits Racine. Complete photo coverage is usually requested with prints for the press services needed on the same day. Other miscellaneous jobs include photo murals for various offices, production of Kodalith positives for use by company artists in making silk screens, and photo copy and photostat work for various departments. Container and product-in-use photos are the responsibility of the photo section. Frequently, more than one hundred 8 x 10 prints must be turned out for product releases on a "rush" basis. Whenever possible, the 8 x 10's are made on the view camera so that they can be printed by contact, with the resultant saving of working time over projection printing.

When large orders are involved, the photo fin-

Joanne Novak in print finishing room. Slot in wall above sink *(left)* connects this room with darkroom.



Printing and enlarging are done here. Omer Bass is at dry area while Eleanor Zore mixes chemicals.

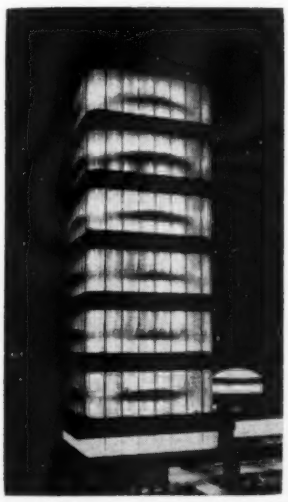
Eight minutes was total time needed to take this shot of an international conference of subsidiary and distributor people held at Racine. Careful planning made this possible. Chalk marks were used to indicate position of each person in the picture. Color and black-and-white shots were made from a specially-erected temporary scaffolding.

isher, Eleanor Zore, gets assistance on washing and drying of prints from the secretary. Otherwise, she handles all photo finishing herself, from mixing chemicals and keeping an inventory of paper and chemicals, to printing and finishing. She has been in the photo lab for 12 years.

Developing of the negatives is done by the photographers who took the pictures.

One of the management problems in any photo section or similar staff activity, is the allocation of costs. At Johnson, no attempt is made to compare costs of in-plant work with commercial prices because no outside company could possibly supply "on-the-spot" coverage. Once a month, charges are computed and allocated to the departments which have ordered the work, levied on a minimum-fee basis which does not cover actual costs.

Although most of the work is for public relations or sales, there are various production assignments which the photo section fills. Filling set-ups are often assembled and then dismantled to handle different sizes or special offers. Photographs are made of the filling lines for future reference by company engineers, both still and movie. Chemical processing equipment is often photographed to serve as guides for engineers in Johnson's overseas subsidiaries setting up a similar operation.



Research and Development Tower, taken by Omer Bass.

Al Krescanko, head of the department, has been with Johnson about nine years. A former studio owner in Racine, Krescanko volunteered to assist Ezra Stoller make pictures of the then newly completed Research and Development Tower for *Life*, in 1950. Upon completion of Stoller's assignment, he offered Krescanko a job. For the next year, the two traveled about, making pictures for architectural and home design magazines. Upon his return to Racine, Krescanko became a member of the Johnson photo department.

Unlike photo departments working in other fields, such as missiles, electronics or aircraft, there is seldom any spectacular assignment to be filled. Instead, this section is called upon for all the bread-and-butter work which is basic to any industrial group—a new executive, a change in a machine, new packages for a sales brochure. But for all this work, they are dependable, available and versatile, always turning in a good job. In any field, that's the mark of a real pro.—THE END

SOUND FILMSTRIP PROJECTORS

Compact, efficient sound slidefilm projectors are a complete A-V system for the least expensive photo format.

Like any other kind of communication, filmstrips (or sound slidefilms as some say) depend heavily for effectiveness on their presentation. Key to filmstrip presentation is the projector. Listed opposite and on the following page are the sound slidefilm projectors available on the American market and known to PMI at press time.

One of the reasons for selecting filmstrips for audio-visual presentation is their economy. In the standard filmstrip, each frame is exactly the format of a standard 35mm motion picture. Reproduction of this format is a completely automatic process. Therefore large quantities of duplicate filmstrips can be made at extremely low cost per frame.

Because the system is based on the efficiency of motion picture reproduction, the traditional projector was built around the horizontal single frame 35mm range. However, some of the machines will also project double frame 35mm image—making it possible to prepare a one-shot filmstrip directly in almost any standard 35mm still camera. Others in the line-up offer an additional option, they are able to project 2 x 2 slides.

The most automatic of the sound filmstrip machines automatically change pictures when their mechanism is set off by an inaudible signal on the sound system (which may originate either from a record or magnetic tape). This system eliminates the sometimes disruptive "ping" long associated with sound filmstrips.

MODEL	FORMAT	POWER	SOUND SYSTEM	OPTICAL SYSTEM	WEIGHT	PRICE	NOTES
AUDIO-MASTER CORP., 17 E. 45th St., New York, N. Y.							
Audioscope Executive	Single frame horizontal filmstrips.*	110V AC 60 cycle	3½-watt 3 tube amplifier, integral 5-in. speaker. 3-speed turntable.	f/3.5 lens, 75 watt lamp.	15 lbs. approx.	$98.50	Completely self-contained unit has rear projection screen 6 x 8 in. Film advance is wholly automatic or manual. Storage space provided for 3 filmstrips.
CHARLES BESELER CO., 219 S. 18th St., East Orange, N. J.							
Salesmate Model 8300	Double frame horizontal film- vertical filmstrips with ASA aperture and frame size.	As above.	5-watt all-transistor stereo amplifier. integral 4-in. 10-oz. magnet speaker. Magnetic tape player operates at 3.75 in. per sec.	Projection Optics 1-in. focal length lens. 300 watt G.E. lamp #T-52, CTS filament. Reflector and 2 condensers plus heat absorbing glass and blower.	15 lbs.	$325.00	Operates—[illegible] magnetic or inaudible signal at 1000 cps. Transistor circuits require no warm-up time.

CHARLES BESELER CO., 219 S. 18th St., East Orange, N. J.							
Salesmate Model 8500	Double frame horizontal film-strips* vertical film-strips with ASA aperture and frame size.	As above.	5-watt all-transistor stereo amplifier. Integral 4-in. 10-oz. magnet speaker. Magnetic tape player operates at 3.75 in. per sec.	Projection Optics 1-in. focal length lens. 300 watt GE lamp #T6½, CTS filament. Reflector and 2 condensers plus heat absorbing glass and blower.	15 lbs.	$325.00	Operates on all automatic or inaudible signal at 1000 cps. Transistor circuits require no warm-up time.
BRERETON, GROVER & CO., 400-404 E. 20th Ave., Denver, Colo.							
Mr. Sales Master Model SM-4	Single frame filmstrip.	110–120V AC 50–60 cycle less than 15 amps.	2-watt amplifier, 4-in. integral speaker, 3-speed turntable.	1½ in. lens, 150-watt Sylvania Lamp #T10 Tur-focus ASA BEH, Reflector and condenser plus heat absorbing glass and blower.	12 lbs.	$144.75	Single case unit houses sound system and projector. Inside lid serves as table top 14¼ x 12¼ screen. Film advance manually operated.
CAMERA OPTICS, 37-19 23rd Ave., Long Island City, N. Y.							
C.O.C. Communicator	Single frame filmstrips.	110–120V AC 50–60 cycle less than 15 amps. with tone and volume control.	1½-watt amplifier, 4-speed turntable 5-in. integral speaker.	50mm f/3.5 lens, 75 watt Radiant PXEB lamp, reflector and double condenser.	14 lbs.	$98.50	Self-contained unit has rear projection on 6 x 8 in. screen. Film advances on audible signal.
DONNLU-SIEGEL CORP., 148 W. Michigan Ave., Jackson, Mich.							
Synchro-Mat	Single frame horizontal; double frame horizontal and vertical or horizontal 2 x 2 slides.***	110–120V AC 50–60 cycle less than 15 amps.	Transistorized amplifier, separate 8-in. oval speaker. Magnetic tape player and recorder operates at 3¾ and 7½ ips.	Lenses available from 3 to 10-in. 500 watt lamp. Reflector and one condenser, heat absorbing glass plus blower.	38 lbs.	$495.00 approx.	Model F for filmstrip projection, model S for slide projection. Wholly automatic and inaudible signal operation. May be operated semi-automatically by remote control with 10½ ft.cord.
DUKANE CORP., St. Charles, Ill.							
14A230B Flip-Top	Single frame horizontal.	110–120V AC 50–60 cycle less than 15 amps.	2-watt amplifier, integral 4-in. speaker. Record turntable operates at 45 rpm.	1⅝-in f/3.5 focal length lens. 100-watt Radiant lamp #CDX. Reflector and two condensers, heat absorbing glass and blower.	13½ lbs.	$115.00	Self-contained unit has built-in rear projection screen. Filmstrip advance by audible signal.
14A233B Flip-Top	As above.	As above.	As above except turntable operates at 33⅓ rpm.	As above.	As above.	$120.00	As above.
ELECTOMATIC CORP., 8228 Second Ave., Detroit, Mich							
Mercury Suitcase Projector	35 or 16mm single frame.	110–120V AC 50–60 cycle less than 15 amps.	Transistorized amplifier, tape recorder operates at 3¾ ips.		14 lbs.	On request.	Projector has solenoid drive which is triggered by the tape. Has pull-out line cord, start switch and remote control receptacle. Automatic shut-off at end of story.
GRAFLEX, INC., 3750 Monroe Ave., Rochester, N. Y.							
Illustravox Manual 150-M	Single frame horizontal.	110–120V AC 50–60 cycle less than 15 amps.	5-watt amplifier, (6 tubes) jack for external speaker. 5 x 7 in. Alnico integral speaker supplied. 33⅓, 78 rpm. turntable.	3-in. f/3 lens standard. 2 and 4-in. lenses available. 150 watt lamp. Reflector and one condenser plus heat absorbing glass.	25 lbs.	$169.50	Manual operation with hand-operated remote pull cable or by manual control knob. Space provided to store 3 filmstrips and 3 (12-in.) records.
Illustravox Remote Manual 300 RM	As above.	As above.	As above.	As above except 300-watt lamp plus blower cooling system.	25 lbs.	$179.50	As above.
Illustravox Remote Electric 300 RE	As above.	As above.	As above.	As above.	As above.	$189.50	Semi-automatic operation with push button electric film advance. Manual advance knob also provided.
Illustravox Automatic 300A	As above.	As above.	As above.	As above.	As above.	$219.50	Fully automatic operation with audible or inaudible signal at 30 cps. Has remote control cord for semi automatic operation.

continued on the following page ▼

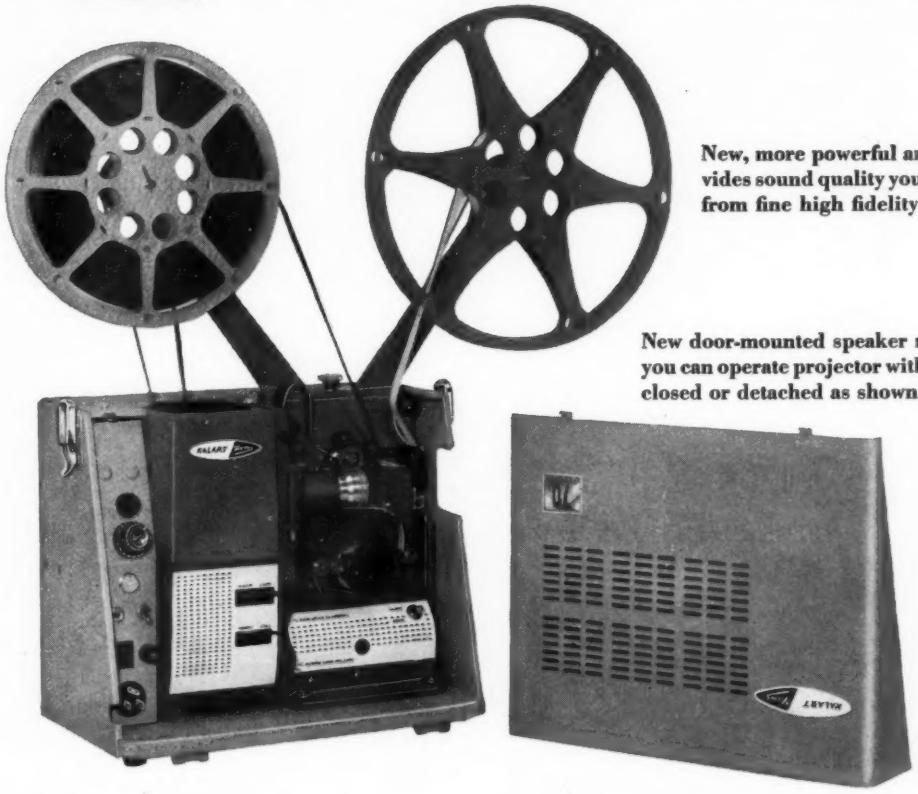
*24.5 x 18mm (single frame horizontal) ***34 x 32mm (vertical or horizontal 2 x 2-in. slides) **36.3 x 24.5mm (double frame horizontal)

MODEL	FORMAT	POWER	SOUND SYSTEM	OPTICAL SYSTEM	WEIGHT	PRICE	NOTES
LA BELLE INDUSTRIES, 510 S. Worthington St., Oconomowoc, Wis.							
AV Tutor I	Single frame vertical filmstrips.	110–120V AC 50–60 cycle less than 15 amps.	3-watt amplifier, 5-in. integral speaker magnetic tape player accepts cartridge type tapes only.	3 in. f/3.0 lens, 300-watt Westinghouse lamp #CWD T10 4-pin. 5 and 7-in. lenses available, heat absorbing glass plus blower.	28 lbs.	$295.00	Projector film advance is automatic on inaudible signal at 1000 cps.
AV Tutor II	As above.	As above.	As above except accepts reel type magnetic tapes only.	As above.	As above.	As above.	As above.
McCLURE PROJECTORS, INC., 1122 Central Ave., Wilmette, Ill.							
Picturephone Model N	Single frame.	110–120V AC 50–60 cycle less than 15 amps.	2½ watt amplifier, 5-in. integral speaker 3-speed turntable.	3-in. f/3.0 lens, 150-watt Sylvania lamp #CAR. Reflector, condenser and lens, heat absorbing glass and blower system.	13 lbs.	$119.95	Self-containsd unit uses inside lid as projection screen.
UNITED STATES PROJECTOR CORP., Federal Way, Wash.							
Success-O-Vox	16mm single frame.	110–120V AC 50–60 cycle less than 15 amps.	2-watt amplifier, 4-in. integral speaker, jack for 6-in. remote speaker. Magnetic tape player operates at 3¾ ips.	1-in. f/1.8 lens, 150 or 200-watt GE or Westinghouse lamp. Reflector and single condenser, heat absorbing glass plus blower system.	22 lbs.	$325.00	Projector film advance is wholly automatic inaudible signal at 1000 cps. May be operated by 8-ft. remote cord either to interrupt voice and film or to advance film.
Adslide	As above.	110–120V AC 50–60 cycle less than 15 amps.	As above.	1-in. f/1.9 lens, 150 or 200-watt GE or Westinghouse lamp. Reflector and condenser, heat absorbing glass and blower system.	50 lbs.	$425.00	Self-contained rear projection unit is removable from cabinet for standard projection. Film advance same as above.
VICTOR ANIMATOGRAPH CORP., Hultenius St., Plainville, Conn.							
Model Pb Portable Phono	Single frame or 2 x 2 slides.	110–120V AC 50–60 cycle less than 15 amps.	2-watt amplifier, 4-speed turntable with universal cartridge for standard and microgroove recordings. Detachable 4 x 6-in. speaker with 15-ft. cord.	300-watt or 500-watt projector available.	12 lbs.	$80.00 *sound unit only*	4-speed phono will accommodate all Victor Soundview projectors. Space for roll-up screen extra film strips.
SMT Manual Phono	As above.	As above.	2-watt amplifier, 4-speed turntable with universal cartridge. 8-in. speaker mounted in detachable id has 25-ft. cord.	As above.		$110.00 *sound unit only*	These models may be combined with any Victor-Soundview PS projector. Feature separate tone and volume controls. High or low frequency controller converts unit to automatic operation. Cabinet has space for projector.
SAT	As above.	As above.	As above.	As above.		$145.00 *sound unit only*	Combined with any model PS Victor-Soundview projector automatically advances film with either high or low frequency controller. May be manually operated with remote control.
VIEWLEX, INC., 35-01 Queens Blvd., Long Island City, N. Y.							
Salestalk V-6	Single frame filmstrips and double frame filmstrips.	110–120V AC 50–60 cycle less than 15 amps.	1½-watt amplifier, 4-speed turntable 3-in. integral speaker.	100–150-watt lamp, Reflector plus two condensers, heat absorbing glass. 2 to 11-in. focal length lenses available.	14 lbs.	$99.50	Manually operated film advance. Attache type case houses unit, inside lid serves as projection screen.
Salestalk V-2	As above plus 2 x 2 slides.	As above.	As above.	As above.	As above.	$129.50	As above.
Viewtalk WR, WHD & WV	As above.	As above.	2½, 3½ and 5-watt amplifier, 5 x 7 to 8-in. separate speakers on 15-ft. cord. 4-speed turntable.	2 to 11-in. lenses available, 150–500-watt lamps, reflector and two condensers plus blower system.	20–27 lbs.	$129.50 to $224.50	Semi-automatic operation and manual operation. Models vary on format and lamp wattage.

NEW

KALART VICTOR

16mm SOUND PROJECTORS



New, more powerful amplifier provides sound quality you expect only from fine high fidelity equipment.

New door-mounted speaker means you can operate projector with door closed or detached as shown.

Offers the Basic Improvements You've Wanted for Years

If you have been waiting for basic improvements in 16mm sound projector performance the new KALART/VICTOR will be a delight to your eyes—and ears. Here are just a few of the reasons why:

1. Distracting mechanical noises are completely eliminated. With projector mechanism completely redesigned, KALART/VICTOR is now the quietest running of all leading 16mm sound projectors.

2. Amplifier power is increased for better sound reproduction. A new 15-watt amplifier has been audio-engineered for KALART/VICTOR Model 70-15 projectors. It provides undistorted sound reproduction over a frequency range comparable to that of the finest high fidelity equipment.

3. Speaker placement is more flexible than ever before. In-the-door speaker mounting now means that the speaker operates on the projector itself, next to the projector, or up to 50 feet away.

4. Lubrication is required only once a year. Improved mechanical efficiency and elimination of high-speed components make oiling necessary only at annual servicing.

5. Light output is vastly improved. A more efficient shutter alone provides a 12% increase over previous Victor models. Incorporation of new shuttle framing further boosts light output. The KALART/VICTOR encourages still picture projection, too. Stills are 5 times brighter with no cost increase for optional "extras."

See and hear the new KALART/VICTOR at your authorized Victor Dealer today

FREE BOOKLET

Answers all of your questions about the newest in 16mm sound projectors. For your copy, write directly to Victor in Plainville, Conn., or ask your dealer.

VICTOR ANIMATOGRAPH CORPORATION Est. 1910

DIVISION OF KALART

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Get more information. Circle 454, page 83

THE FINE ART OF MANAGEMENT

There is more to management than telling somebody what to do and when. Chiefs of some of country's top photo sections spent a week comparing headaches at the PP of A Industrial Management Seminar, looking for answers to the complete executive. Main problems are cutting costs, selling photography to corporate brass.

How do you convince a vice-president that your section needs another photographer? What type of background should you look for when hiring a new man? How do you install and maintain a cost-accounting system? How do you charge off photographic expenses? Should all photographic activities be centralized under one department?

These were some of the questions raised by the thirty participants in the second annual Industrial Photographic Management Seminar at the Winona School of Photography, August 24 to 28. Sponsored by the Professional Photographers of America, the sessions enabled photo managers to compare notes and sharpen the skills needed to supervise the growing photo departments of American industry.

Heading sections from 1 man to 180, the group members represented such private and governmental organizations as IBM, International Harvester, Sandia Corporation, Rockefeller Institute, Army Signal Corps, Navy and Air Force. The work of their sections ran from photomicrography to missile tracking, but all the managers charged with supplying photo service to non-photographic enterprises, faced the same types of administrative problems.

Two group's most important problems were how to sell photography to their companies and cost-accounting within the photo section, providing service without exceeding the budget.

Helping the group find answers was the five-man panel of leaders. They disclaim the "expert" title, pointing out that an expert is any man more than 50 miles from home. Chairman of the panel was Dick Kinstler, Procter & Gamble photo department manager. The four panel members included Earl Stanton, Bell Aircraft; Ed Purrington of Ford who was last year's chairman; Allie Peed of Eastman Kodak Sales Service; and Dr. Arthur Gutenberg, Arizona State University and PP of A's management consultant. With the exception of Dr. Gutenberg, all panel members participated in last year's seminar, the first one offered in this field.

The idea for a management seminar grew out of a questionnaire sent by PP of A to members of its Industrial Division, asking them for ways in which the PP of A education program could be tailored to fit their needs. The answers indicated an interest in management problems and accordingly, the first seminar was held at Winona in 1958. Its resounding success made a return engagement for 1959 a certainty.

Management is very much like electricity. Both are essential in modern industry but both are easier to see by what they do rather than what they are. Electricity, of course, is a fairly plentiful item, but according to most business leaders, management ability is perhaps the rarest resource in industry. While the nature of a photo section presents special problems to the department head, basically his management problems are the same as that faced by managers everywhere, from the head of a large corporation to the newest foreman on the production line, namely, to minimize inefficiency through a correct allocation of material and labor. The key to good photographic management is the proper handling of human relationships.

BASIC MANAGEMENT PRINCIPLES

The overall setting of management's role in modern industry was established by Dr. Gutenberg, the leadoff man, in his sessions on *Management Fundamentals.* A concentrated dose of management theory, the session described the function of the manager as basic to any system using division of labor. As industrial organization has become more intricate, the number and variety of managers has increased until they represent, in the United States, at least a new leadership class, having the power and position, but not necessarily wealth of the older industrial giants.

But the manager is not always the leader of his group. Dr. Gutenberg pointed out that the former is appointed from above whereas the latter comes from within the group as one who can interpret and satisfy the group's needs. These needs, as far as labor is concerned, are not always what management thinks they are. A recent survey among management people on what they thought workers wanted most placed "wages" and "job security" at the top of the list. Workers placed them in fifth and fourth place, respectively, preferring "appreciation" and a "feeling of belonging." Unless the motivating factors which make people act in certain ways are kept in mind at all times, a manager can never do a good job. While he may get obedience, he can never get the free cooperation of his people, the prime requisite of a really effective group.

This talent is not always found in people who are among the most competent technically, but is a generalized skill, applicable to any organized group. "Professional management," remarked Dr. Gutenberg, "has become a new class, with a definable skill which can cut through traditional lines of industry. A purchasing agent is closer to his counterpart in another industry than he is to an engineer in his own plant. The result is that the manager, on whatever level he operates, has similar problems and goals, namely, the creation and operation of a smoothly functioning, highly efficient organization." The problem is to get efficiency without sacrificing individual welfare.

Dr. Arthur Gutenberg, PP of A's management consultant, diagrams line, staff relationships to place photo department in proper perspective. **(continued on overleaf)**

PHOTOGRAPHIC FACTS FOR MANAGEMENT

Dick Kinstler and Al Peed teamed up to discuss *Photographic Department Organization*. The role of an organization they declared, is to subdivide the work, deciding who does what and where. The most important factor in the unit is morale, the "plus" which makes members work harder and better on behalf of the group.

Important in the industrial photographic situation is the informal organization consisting of personal relationships cutting across the formal organizational pattern and including social groups, cliques and favorites. However, there is a danger that unless controlled by the formal leader, informal organization may present a threat to the organizational pattern. Cases cited included doing personal work, showing favoritism in performing assignments and reducing the section to a level of politicking.

Dick Kinstler

This proved to be a fairly widespread problem which several managers solved in various ways. At one firm, personal work is charged to the department to which the man requesting such work belongs. Another allows such work but after hours, not on company time. In one government agency, all work has to be accompanied by a signed work order attesting that this is "for official use" only. The responsibility of the section ends with receipt of the work order properly made out and approved.

Al Peed

However, a great deal of emphasis was placed upon personal contact as a means of selling the photo department, finding areas in which photography could help other departments. One suggestion was made that the photo supervisor spend more time with other departments as a public relations man. "It is up to the photo section to find new areas and bring new uses for photography to the attention of management."

COST ANALYSIS AND RECOVERY

Cost Recovery Systems discussed by Ed Purrington, Ford, divided photo operations into three types, depending upon how the costs of operating a photo section were treated by the company.

In a "luxury" operation, the primary use of the section is for "pet" projects and the costs are treated as a prerequisite of management.

The "cost-justification" operation makes an in-plant section practical only when costs of in-plant service are lower than the price of outside photographs. Here, the important point is which types of services are compared, i. e. mass-production houses, top studios, commercial houses, etc.

"No alternative service" is applicable in cases when problems of location, security considerations or time make it impossible to use out-of-plant service.

Ed Purrington

Purrington recommended a budget as a target for costs measured in the management language of dollars and cents. His section has been on a budget since 1946 and costs charged are generally very close to actual costs. There are times when costs will climb, due perhaps to rush orders and extra overtime, but normally the budget and the actual costs should come out fairly even.

"Keeping costs down at Ford is especially important since there is no rule that photo service must be ordered from the plant photo section. Any department is free to go out on the market for any service they need. Costs can be reduced by better training of people for higher output, selection of materials for speed and consistency. In the case of materials, the best is sometimes the cheapest if it gets work out faster."

In some cases, operations can be eliminated by providing cameras for people in other departments. A case in point was the photography for possible damage claims of damaged goods in freight cars. Instead of waiting for a photographer, the foreman at the loading dock now has a Polaroid camera to record the damage.

PERSONNEL SELECTION AND TRAINING

Earl Stanton, head of Bell Aircraft's photo department, speaking on *Photographic Facts for Management*, assigned to the photo section responsibility for finding new uses for photography within the company. Classing it a problem of internal public relations, Stanton suggested that photo managers get to know the immediate supervisors in other departments, learning something of their problems and where photography can help solve them. He also reminded the group to treat people who request service as customers and to keep up with current techniques by reading professional journals, trade publications, hobby magazines and manufacturers' technical manuals.

Earl Stanton (at board)

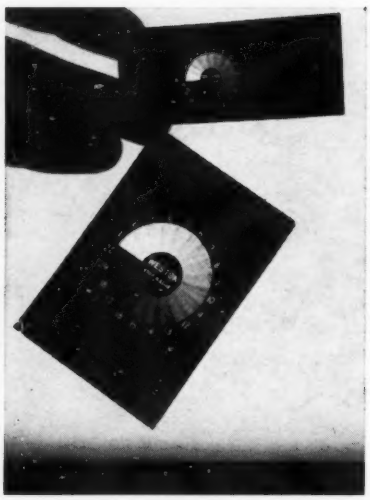
Reports to management were stressed as important tools for justifying the existence of the photo department, giving data on work loads, costs and material needs. There is no standard as to the number of people needed but speed and skill are important in providing the service that mnaagement has a right to expect from an in-plant department. He also warned against having too narrow a perspective, recommending that photo managers become generalists interested in company problems as a whole.

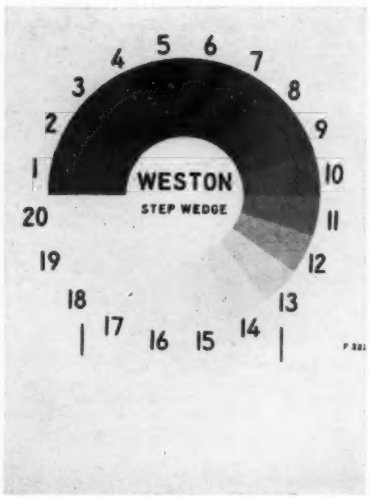
Earl Stanton opened his remarks on *Personnel* by saying that he was "allergic to album carriers" because he could never tell how long it took the applicant to make the pictures. His method of screening is to ask technical questions and then, perhaps, give a sample assignment.

During this session, a poll was taken on sources of trained people for photo sections. Leading sources were: other firms—15; photo schools—12; studios or business—11; former amateurs.—12.

Meeting fellow photo heads was perhaps most valuable part of Winona seminar. By providing a sense of identity, it helped create a certain pride in role of photographers in industry. Informal poll at end of sessions revealed cost accounting period most valuable, with management principles next. Participants found, perhaps to no one's surprise, that both industry and government have management problems in common.

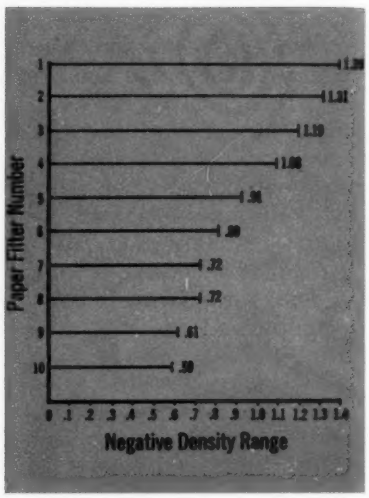
ARE YOU A DIP & DUNK PHOTOGRAPHER?



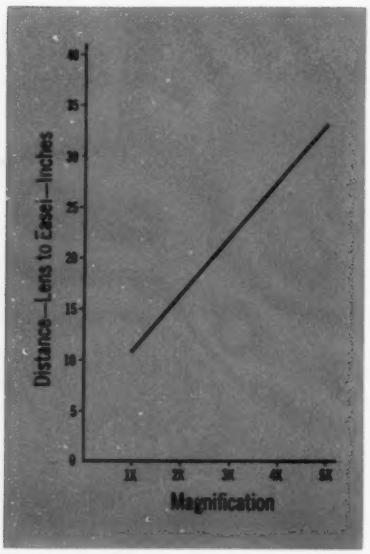


MEASURE NEGATIVES, GET BETTER PRINTS FASTER

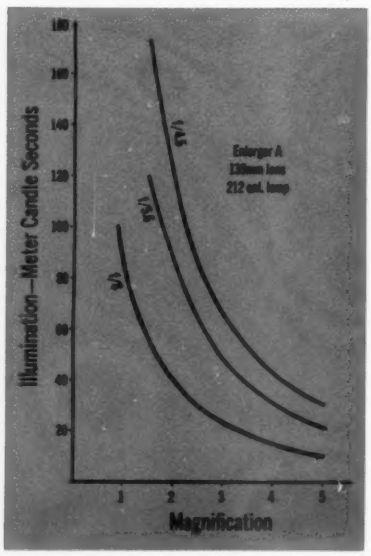
Prof. Bowman teaches the method shown here to pre-read negatives, as first step toward darkroom efficiency. System begins with step wedges *(left)* supplied with densitometer. Small one is for 35mm. Make print on each contrast grade *(above)*.



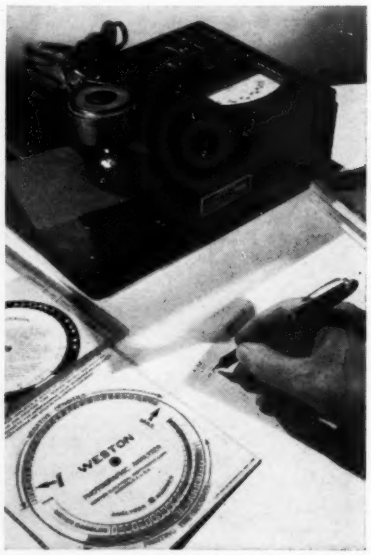
Prints of calibrated negative wedge reveal density range accepted by each grade of paper (steps 6 to 15 in print *left*). Chart results *(above)*.



To chart magnification, plot enlarger height against enlargement of distance between one-inch marks contained in step wedge.

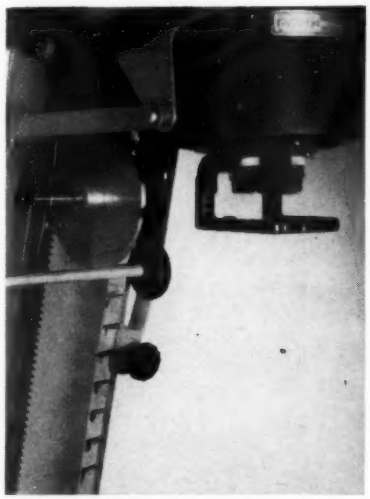


Densitometer has photocell for easel readings. Chart *(above)* is made with data from readings, shows light fall-off at any magnification.



Tests are complete. Photographer reads maximum and minimum density for each negative—computes density range, paper contrast, print time.

State University of New York Prof. Raymond C. Bowman lets loose a blast at archaic techniques and guesswork habits of photographic processing in use by industrial photographers who should know better— and outlines plans for better, faster work in any sort of darkroom



Calibrating enlarger is easy job. Paint one-inch marks on post or rail. Guide line on plastic runner shows where you are. Inch marks apply to all lenses.

Prof. Bowman estimates negative readings require 1/3 min. each. Efficiency begins here as printer sorts negatives by their contrast.

Most industrial photographers use a dip and dunk method of processing pictures that was already old stuff when the Stanley Steamer disappeared from the used car Blue Book, according to Associate Professor Raymond C. Bowman, head of the photographic equipment technology curriculum at the State University of New York at Farmingdale, Long Island. Many industrial organizations, he says, permit outmoded, inefficient and downright wasteful practices in their photographic labs. If anything like these practices took place in a production line for more than a few minutes, sirens would scream and dozens of foreman would be called on the carpet.

Bowman thinks that even a one-man photo outfit can afford the equipment to become more efficient. He thinks that bigger departments have proportionately greater chances for efficiency. He places part of the blame on photographers who teethed on inefficient methods, worked hard to perfect their technique within the limitations of these methods, and now don't even think of giving them up. In industrial work, he places equal blame on management that is too shortsighted to invest in photographic departments.

Prof. Bowman's ivory tower is a series of below-ground laboratories in the State University's Farmingdale campus. In them he heads a series of courses designed to train young men for careers as technicians in the photographic manufacturing and finishing industries, in which New York is the leading state. Outside of his academic work the tall, white-haired, fortyish professor travels on frequent trouble-shooting and consulting jaunts. He claims no originality for his ideas; on the contrary, has seen each of them carried out here and there throughout the country. The surprising thing, he feels, is that so few large users of photography are even aware of their existence.

Prof. Bowman believes in efficiency. He also believes in quality, but neither at the price of the other. When it comes to efficiency in photography the picture is a basic black. One of the barriers to efficiency, he feels, is the way people in photography think about it. Ask a photographer how he's making himself more efficient and he's apt to tell you that he put a button on the bottom of the camera so that it clicks into the tripod instead of screwing into it—or that he now uses quick fix so that he processes film much faster—or that he makes his prints on 8½ x 11 paper rather than 8 x 10 so that it can be punched into a loose leaf binder without dry mounting it to a larger sheet—or that he is so practiced at making prints that he can now print 15 negatives an hour where he formerly was only able to do 10. Efficiency, Prof. Bowman says, is not what you can do today compared to what you could do yesterday. It is what you are doing, compared to what you could be doing. For example, he thinks that one very skilled man, backed up with some of the photofinishing equipment on the market today, and really hopping, could print over a thousand negatives in one hour, process and dry thousands of prints while he is printing—and do a darn good job of it.

This kind of super-production is by no means the answer to every problem, or even to many problems in industrial work. But today most departments are overworked. The overwork precludes developing photographic service to anything near its potential in industry. In some cases it slows down delivery speed much below what should be expected of an in-plant unit. And furthermore, the best guess of everyone in the field is that more production, not less, is going to be demanded of the photographic unit in industry in the future. Prof.

Bowman concludes that there is every reason for any industrial laboratory to handle its job in the most efficient way possible.

Test strip: a villain

One of Prof. Bowman's pet peeves is the test strip. He thinks a test strip is fine for a Boy Scout working on his photography merit badge. When it comes to professional work, however, the test strip wastes time, wastes paper and in the end doesn't give half the information needed to make a good print, he says. Particularly in industrial work where the first picture may be a portrait, the second the controls panel on a plane with bright sunlight streaming through the cockpit dome and the third a flash shot down a storm sewer—the test strip is far less than adequate. What the photographer needs to know—and what he finds out sooner or later, the hard way—is the proper f-stop for his enlarger, the proper time for his timer, the proper contrast grade, the amount of dodging and burning-in required.

In his trips to professional laboratories, Prof. Bowman brings up the subject of test strips. Most, he says, claim they do not use test strips. But their wastebaskets belie the claim. What is substituted for a test strip is a full-size print. And if you watch a printer working over a developer tray, you find him trying to make up for bad guesses in exposure with hot soup, hand-warming and massive variations in developing time. To Prof. Bowman, all this represents so much wasted time, wasted material and substandard technical quality.

A favorite slogan of the professor's is that "you can't fool the print paper." It reacts according to the amount of light it receives, and not according to the printer's hopes, fears or wishes. The secret of printing efficiency is to measure the light which the paper will receive. The test strip is an empirical method of doing this. The inefficiency of the test strip lies in the fact that each test strip is a complete research job that must be repeated for every print. It is as if a checkout clerk in a supermarket had to mathematically prove that 2 plus 2 equals 4 every time he used these figures.

Professional photographers have a wide choice of printing meters available on the market. Prof. Bowman's message is: "Pick out the one most suitable for you, buy it and use it."

The use of one such device is shown in the pictures on the first two pages of this article as Prof. Bowman teaches it to his students. With such a system it is possible to read about 30 negatives in ten minutes, Prof. Bowman estimates. As used in one application, Republic Aviation Corporation's photo lab, a clerical worker is trained to make the readings before the negatives go to the print room.

For an investment of about $135 for an electrical densitometer, plus the time required to zero in the equipment and materials—the printer removes guess work about paper grades and exposure time and cuts waste.

To Prof. Bowman the real importance of pre-measuring negatives, however, is that it opens the door to continuous handling of photographic finishing. Continuous processing is the giant step forward in most production. George Eastman originally coated one glass plate at a time. Film manufacturers supply the great needs of modern photographers by coating films in giant rolls on endless belts or drums.

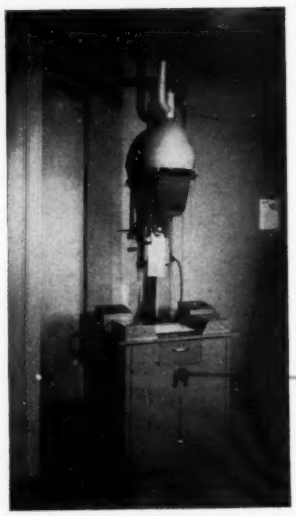
Continuous photographic processing is not at all new, but its application has been limited mostly to the motion picture and photofinishing industries. Prof. Bowman would like more industrial photographers to consider it as a solution to their problems. To show the possibilities of presently available equipment he has drawn up the accompanying floor plan of a possible medium-sized industrial photo production laboratory. It measures 20 x 24 ft.

Prof. Bowman designed it to be operated entirely by one man. The costs were figured after the equipment was selected. Altogether, they run over $25,000. Prof. Bowman believes that it does not require an extraordinary volume to quickly repay the investment because of economies all down the line from personnel to paper and chemicals.

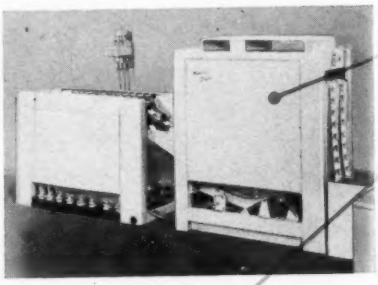
Only one unit for each operation could, of course, be shown in the diagram. Prof. Bowman points out that the machines selected indicate no preferences on his part, he was forced to make a selection among the competing brands for the pur-

Maximum Output Darkroom in 20x24 Ft. Space

A

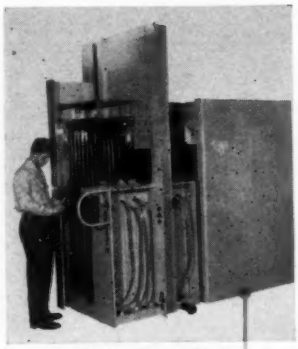


Kodak Master Roll Paper Holder
a. with contact attachment
b. used with enlarger *(above)*



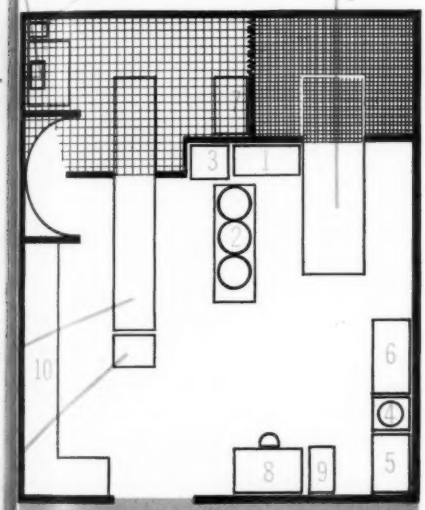
Pako Prosser
handles roll paper at 5 ft. per min.

Kodak Power Trimmer
Model 1, with footswitch



Pakolt Filmachine
he loads, it processes

Lekta Densitimer
it automatically
adjusts print time



1. Replenisher, filtration and circulation unit for Filmachine (15-gal. developer, short stop and fixer tanks) 2. Replenisher, filtration and circulation unit for print processor (55-gal. developer, short stop and fixer tanks) 3. Tempering unit for both film and print processing lines 4. Hydromixer 5. Sink 6. Chemical storage 7. Paper storage 8. Desk 9. File 10. Order handling bench

poses of simplicity.

In order of work flow, the first unit in the system is a Pakolt Filmachine. This unit consists of a series of deep tanks. Film is conveyed from solution to solution on large frames which hang from an endless, moving chain. There are two types of hangers, one for roll film and the other for sheet film. The roll hanger takes any mixture of film sizes, suspends them full length, (except for 36-exposure 35mm film which is doubled on itself). The sheet film hangers take any mixture of sheet film from 2¼ x 3¼ to 5 x 7. The sheets hang free at the bottom, are clipped at the top. The labor involved in running the machine consists of "stripping" the film from its paper backing or cassette or removing it from the holder and clipping it to the hanger. From that point on the machine handles all subsequent operations unattended. At each stage, automatic controls for speed, drying heat, solution temperature and replenishment assure that each sheet or roll of film receives optimum processing—although individual control of developing time is possible. To accomplish this the operator loads only one sheet or roll on a hanger, and advances the hanger a notch ahead or behind on the endless chain. Each notch represents two minutes' time. Any replenisher-type developer is used.

Normal loading time is one hanger in 2 min. A roll hanger takes 7 rolls. A sheet hanger accepts 12 sheets. Thus 210 rolls, or 360 sheets, can be loaded per hour. By keeping the machine running throughout the day, film can be processed as it is received. Depending on the developer used, the negative is delivered dry in about 35 min.—only a few seconds of which require the attention of the operator while he loads the hanger.

The second unit in the system is an easel reading enlarging timer. The particular unit shown makes its reading of any area of the projected negative image the operator selects (reading area is less than the size of a dime with a "Small Spot Pick-up"). A red projected light shows the spot being read. The unit automatically controls the duration of the exposure according to the light reading and the sensitivity of the paper—or the sensitivities of multiple contrast paper under various filtration.

As stated previously, a number of manufacturers produce units which serve to meter exposure.

For making prints, a standard enlarger is wall-mounted above a roll paper holder. Prof. Bowman feels that an auto-focus enlarger should be used to increase the efficiency of the system.

The roll paper easel shown is loaded with enlarging paper in a number of standard widths from 5 to 10 in. Maximum enlargement size is 8½ x 11 in. Prof. Bowman feels that a multiple contrast paper is most suitable for use in the system—although a great variety of papers are available for the purpose. The easel shown has two unusual features. For one it automatically advances the roll to a print size dialed on one of the controls on the unit and at the operator's option either delivers cut sheets or rewinds the paper roll. The second is a system for making multiple prints. The operator selects print size, number of prints and exposure time. This done, the machine takes over and exposes the selected number of prints, then turns itself off—freeing the operator for a coffee break or other work. Capacity is limited only by the size of the roll fed into it—1000 ft. of single-weight or 500 ft. of double-weight paper. Built into the unit are an exposure timer, electrical counter, timer and border masks.

Light source and platen accessories to the unit adapt it quickly for contact prints from any negative up to 8 x 10 in. One of the two light sources available is made to vary the contrast of multiple contrast papers.

Once the roll of print paper is exposed, the operator threads it into the next unit—an automatic roll paper processor. Again, attended time is limited to loading the machine. In the machine shown, an automatic replenishment system begins as soon as the roll of paper is placed in the receptacle provided. It takes the paper through a series of deep tanks in the conventional order of processing solutions—and automatically feeds it onto a drum drier. Finally the finished roll is fed picture side out on a take up reel.

In the machine shown, the leading edge of the exposed roll is attached to any part of an endless belt that moves throughout the unit—so any reasonable length of

(*continued on page* 89)

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by Herbert P. Paschel

REPRODUCTION & GRAPHIC ARTS

Paschel fields a reader inquiry on the methods of "Velox" prints

My March, column about "Velox" prints invited readers to drop a line if they had further questions or special problems. Typical of the letters received was this one from a small California newspaper bringing up some specific points interested in utilizing Veloxes to convert to offset printing. The letter asked:

1. What type of halftone screen will give best results; **2.** What is our recommendation for a vacuum easel; **3.** How is contrast control managed; **4.** What effect does exposure and development of the final negative have on halftone detail. **Finally,** the question of reflex copying as a substitute for process work.

Unfortunately, space limitations will force us to give only brief answers but they may provide some guide for such problems.

Screen choice

In answer to your first question, I assume you mean engraved (glass) screens versus contact screens. It is often difficult to detect any difference in results when similar negatives have been made with the two types of screens by equally competent cameramen. But the contact screens do have two significant advantages. The inexperienced cameraman can master the contact screens in much less time than engraved screens and get more consistent results. Secondly, contact screens can be, and are being, made with built-in reproductio nfactors (screen gradient) to suit the requirements of a particular job.

If your question refers to a recommendation as to the best of the available contact screens, a definite statement could be extremely misleading. Performance depends upon many factors—the tone range of the copy; the gradient of the screen apertures; the strength and composition of the exposing light; the spectral sensitivity, speed and reproduction characteristics of the sensitive material; the reproduction characteristics of the optical system; the exposure technique, processing etc. Unless these factors are all properly coordinated, comparison tests are meaningless. Controlled practical tests under existing shop conditions will quickly reveal the combination of screen, film and technique best suited for the negatives needed.

Vacuum easels

Vacuum easels can be obtained from a number of manufacturers as a standard or optional accessory for vertical cameras and enlargers—or one can be fabricated by the user. A circular just received from the Condit Mfg. Co., Inc., Sandy Hook, Conn., lists a registering type vacuum easel in three sizes from 8x10 to 16x20.

Contrast control

The control of contrast when using contact screens is achieved in a variety of ways. A flash exposure (a short fogging exposure) in addition to the main exposure will lower contrast in the shadow parts of negatives while a supplementary highlight exposure without the screen increases highlight contrast. With colored screens, such as the Kodak Magenta Screen, the filter method of controlling contrast can be used. Exposure through a yellow filter lowers negative contrast while a magenta filter exposure raises contrast. White light exposure results in an intermediate degree of contrast. Developing technique affords an additional control. Maximum contrast is achieved with fully agitated development. Completely "still" development (no agitation) produces halftones of minimum contrast. The various controls may be used in combination with each other and in various ratios.

While washed-out whites and loss of shadow detail could be inherent in poorly made halftones, it is also

(*continued on page* 64)

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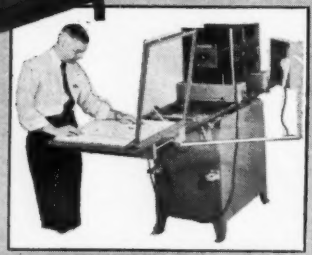

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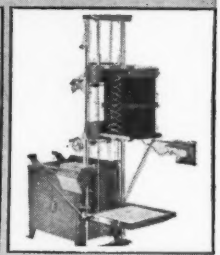

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(*continued from page 62*)

possible that such distortions occurred in platemaking or on the press.

Line pick-up

The line "pick-up" from the combined type and halftone copy is critical only in the sense that exposure and development latitude is very limited. But this is true also of line and halftone photography in general. If your screened "Veloxes" are sharp, of high contrast, and free of fog in the clear areas, the same exposure and development required for a satisfactory negative of the type should result in a record of the screen copy without significant losses. A developing technique of controlled agitation is probably the best system to use for this type of work. But the simple expedient of eliminating variables will make them all less critical.

Reflex technique

In respect to your final question, of course it is possible to use the reflex contact copy technique in making negatives from camera ready copy. The best reflex negative, however, will not be equal in image quality and background density to a good camera negative. Nevertheless, reflex copying might be satisfactory for your application. You must also expect an increase in exposure time when making an offset plate from paper negatives due to the opacity of the paper.

The reproduction of illustrations is a knotty problem for small newspapers all over the world, especially those far from photoengraving services. Many of these have solved that problem by the use of electronic engravers such as the Fairchild and Klischograph machines.

A complete conversion from letterpress to offset would eventually involve a changover from "hot" to "cold" type. In the absence of a film typesetter, an alternative system would be to pull proofs on a transparent material from regular metal type forms. Halftone positives would be made on film and stripped-in with the type proofs. The resulting positive "flat" would then be used to make an offset plate with the deepetch process or with one of the positive-working presensitized plates.

Eventually we will have camera-speed presensitized plates in which case you could then make an offset plate in the camera direct from camera-ready line and halftone copy.

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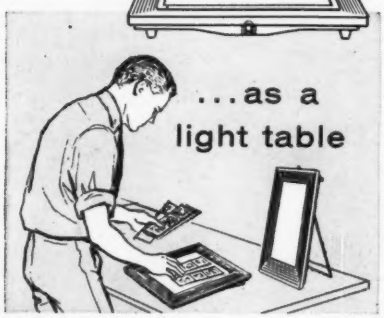

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by Samuel Lang & Leonard Zoref

INDUSTRIAL COLOR

Newly published literature from manufacturer is "must" reading

A sad truth about photography is that so much of the excellent material published by photographic manufacturers goes unread by the men who can most use the information—professional photographers.

Two recent publications of the Eastman Kodak Co. merit special attention. To color photographers (and these days that category should include all photographers), we say get 'em, and read 'em.

There are *Kodak Color Films,* data book E-77 and *Evaluating Color Negatives,* Kodak pamphlet E-52. Both are marked as "major revisions" and should replace previous issues in your information file.

Kodak Color Films discusses the major features of this company's reversal and negative color films. It also takes up filter data, processing, printing mediums, and factors involved in the critical use of color materials.

Quick change

There are several important firsts in this issue of the data book as far as Kodak color is concerned. One is a completely replaceable center section which contains data sheets for all Kodak color films. It is dated with the publication date. With the rapid changes in color films, this is almost as important as the expiration date on the film box itself.

The other innovation is information on how to increase the speed of a color film by adjusting the processing. For years color film has been boosted by professionals and custom laboratories when faced with difficult or near impossible lighting conditions, or to lower contrast by increasing exposure and decreasing first development. But the manufacturer has been mum on the subject. At last the conclusions of experiments in this direction in the Kodak research laboratories are made available to photographers. While reference is made only to altering the speed of Ektachrome E-2 in the data book, it is possible by similar means to increase or decrease the effective speed of Ektachrome E-1 and Anscochrome as well. Two stops is usually considered to be the limit of exposure variations for acceptable results under these conditions.

Unfortunate complications arise when an attempt is made to alter the speed of Ektachrome E-3 films. A color cast cancels out any benefit of altered film speed.

Calling it close

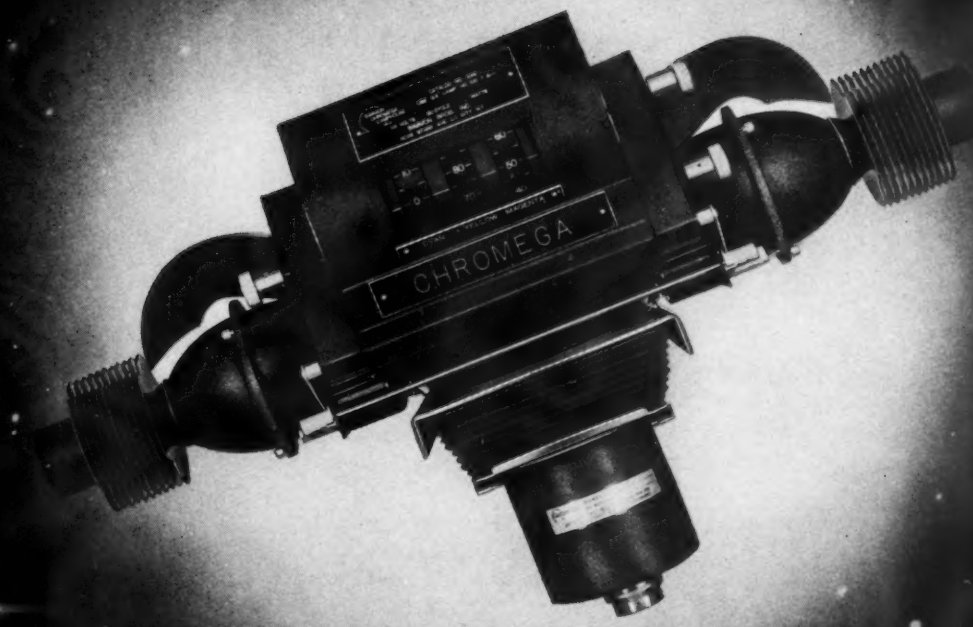
Especially informative is the section on "Critical Use." A very good job is done in explaining most of the causes of variations in color balance and speed.

Photographers have so much faith in the excellent films on the market today that it is sometimes impossible for them to believe that anything except processing could be responsible for variations in results. The data book explains why this is not necessarily so. Here, listed in the order of the time that they may occur, are the principle causes of speed and color-balance variations: **1**—Manufacturing variations among different emulsion numbers. **2**—Adverse storage conditions before exposure. **3**—Illumination of incorrect quality. **4**—Differences in sensitivity with changes in illumination level and exposure time. **5**—Adverse storage conditions between exposure and processing. **6**—Nonstandard processing conditions. **7**—Nonstandard viewing conditions. **8**—Differences in personal judgment.

The information on manufacturing and testing conditions is quite interesting. Exposure times are those which are considered representative of the major applications of the films, and naturally, all are processed according to recommended procedures. Films are considered within tolerance if they do not vary more

(*continued on page* 68)

a new world of COLOR



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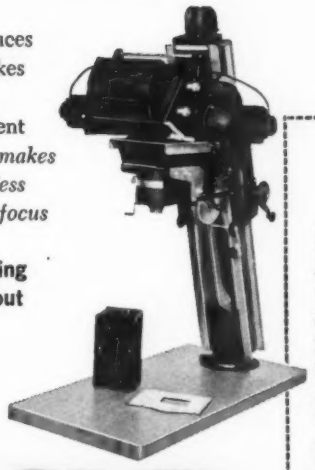

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INDUSTRIAL COLOR

(*continued from page 66*)

than one-half stop in speed and can be corrected by a CC-10 filter over the camera lens. Processing tolerances should be equal but in most cases are actually held closer.

Most photographers at one time or another have decided to check out color labs by making a quantity of identical exposures which they send to the different labs and then compare results. Reasoning from the information under "Critical Uses" one can see that there is a fallacy to this procedure—especially in regard to color balance. There normally is little shift in processing speed. Assuming we had an emulsion that was the equivalent of a CC10 too red and it were sent to lab "A" whose processing that day was CC10 red, the film would look pretty miserable—but processing is within tolerance. Lab "B" processing was running on the head that day so the film would look somewhat reddish and still be objectionable. The processing for lab "C" meanwhile was running CC10 cyan that day, which was no better than lab "A" processing—and worse than lab "B" for most films that day. But it alone wins the silver dollar for that account while others are screaming. The work from most professional labs is usually within an .05 balance.

Evaluating negatives

Evaluating Color Negatives has been brought up to date with some new information on color negative evaluation techniques and equipment. Detailed information is given on techniques which involve use of an electronic densitometer for off-easel spot and large-area evaluation —and on easel spot and large area evaluation. Each system has its advantages and disadvantages. The "spot on easel" method is undoubtedly the most accurate but unfortunately few densitometers are sensitive enough to permit the complete evaluation procedure without having to make diaphragm and magnification adjustments before the final exposure. In our preliminary tests with the MacBeth QuantaLog Color Analyzer, Model EP-1000, appears capable of handling the situation but we are waiting to test a production model of the instrument before committing ourselves. With some modifications, from the one we tested, the instrument should simplify printing considerably. Welch also has a new Densichron which should be available in the near future which will also be ideal.—THE END

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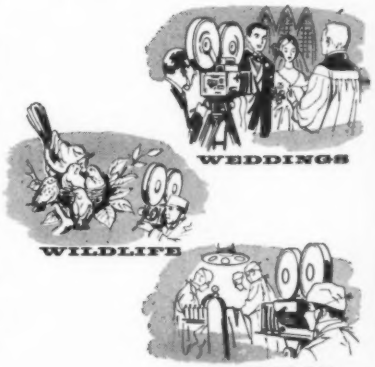

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ROTI

When it comes to finding out what's going on, there's nothing like seeing for yourself. There are times, however, when this worthy end is somewhat difficult to attain, such as when tracking a missile or earth satellite 35 miles above the ground. One answer to problems like these is ROTI, Recording Optical Tracking Instrument. developed by Perkin-Elmer, Norwalk, Conn.

Currently installed at the Atlantic Missile Range, Cape Canaveral, ROTI is an eight-ton optical giant, mounting a 70mm Photo Sonics camera on a 500-in. lens with a 24-in. aperture. The focal length varies from 100 to 500 in. in 100-in. steps. The assembly is mounted so that after the initial missile tracking radar locks ROTI on the missile, two human trackers (one for elevation and one for azimuth) take over, following the tracked object through 50X telescopes. While radar can be used for tracking, it has an unfortunate tendency to pick the nearest available substitute should it lose the actual object being tracked. The missile is photographed on shellburst film a high-contrast black-and-white material.

Perkin-Elmer was founded in 1937 by two astronomers who felt that there was a need for quality American optics in astronomical instruments. In 1955, they began development of the ROTI, with the first models being installed in 1957. A new model, with infra-red tracking capability is now under development.

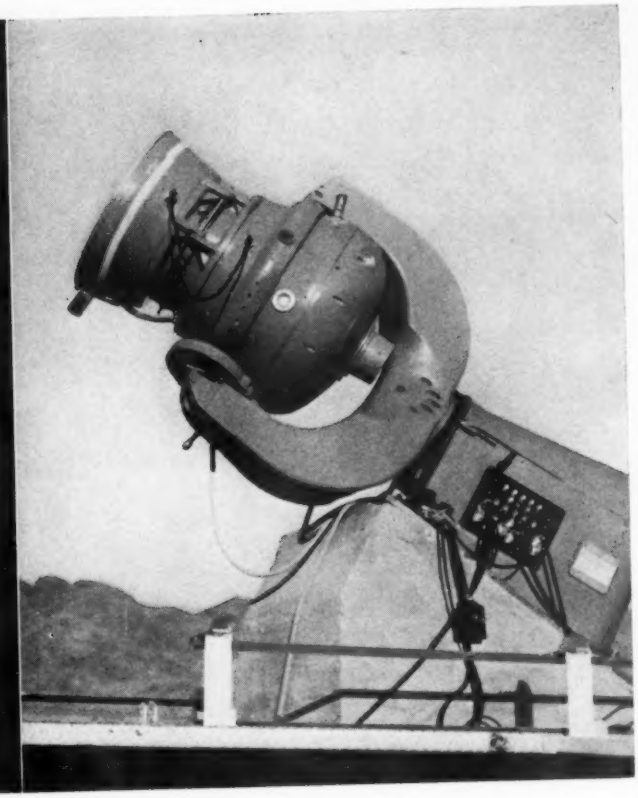
Other instruments produced by Perkin-Elmer for mechanized star gazing include a solar telescope, a meteor camera and a satellite tracking camera.

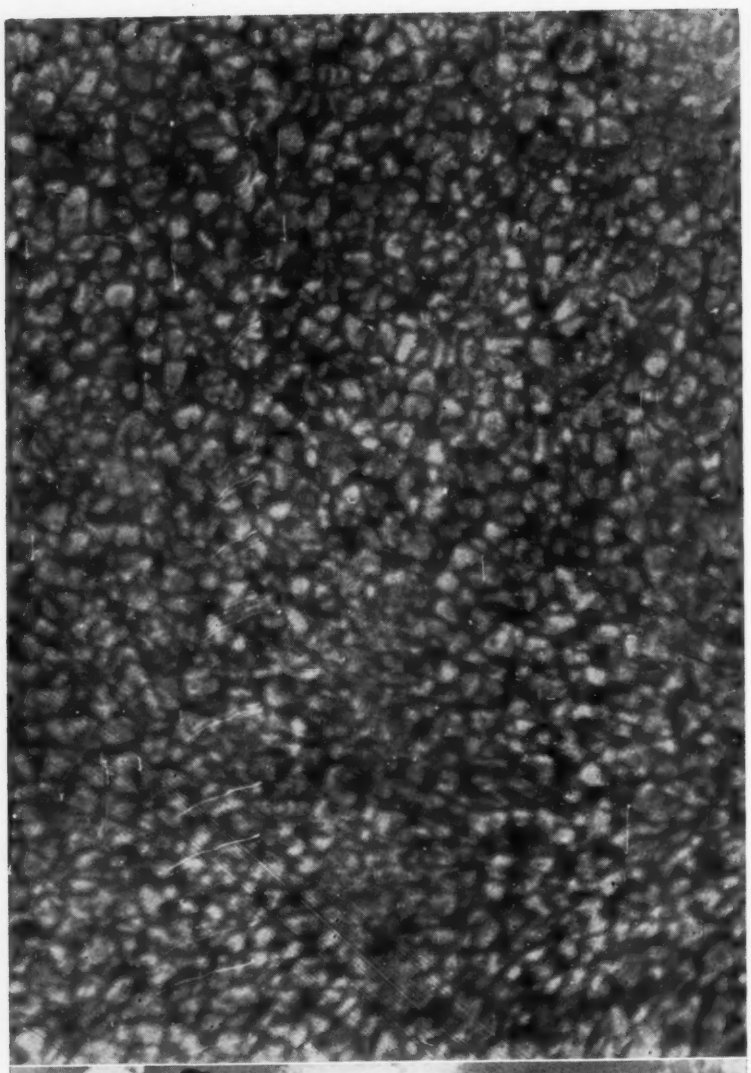
ONE METEOR, ▶ AT 40,000 MPH

Photograph of artificial meteor was taken with Baker Super-Schmidt Meteor Camera in New Mexico. One of six made by Perkin-Elmer, this camera has a f/0.67 lens covering a 52° field. The Air Force has been studying meteors since they behave very much like high-speed rockets. This meteor hit a 40,000 mph velocity before being exploded from an Aerobee rocket at 54 miles up. The picture is recorded on spherical plates. The sky area covered at 52° is equal to 10,000 times the area of the moon. This camera photographed Vanguard I as well as the man-made meteors fired in October, 1957. Perkin-Elmer designs and builds their own lens systems. This f/0.67 is believed to be world's fastest lens. Because of superior dimensional stability, plates are widely used in astrophotography.

EXPLORER I ▶ ORBITS AROUND

Explorer I satellite photographed by one of twelve Satellite Tracking Cameras made for IGY. Costing approximately $100,000 each, these cameras are used to plot the orbits of satellites, giving information on upper air density, true shape of the earth and extremely accurate measurement of distances. The path of the satellite is the line about ⅝ in. The bright streaks at upper and lower left are stars from the constellation Hydra. The cameras were made by Boller & Chivens, South Pasadena, Calif., with lenses at f/1.0 and a 30° field made by Perkin-Elmer. By tracking satellites, the project engineers can trace every movement and see any of the unusual events which may be indicated by instruments. By correlating the appearence with the readings, a more complete picture of the satellite's progress is obtained.



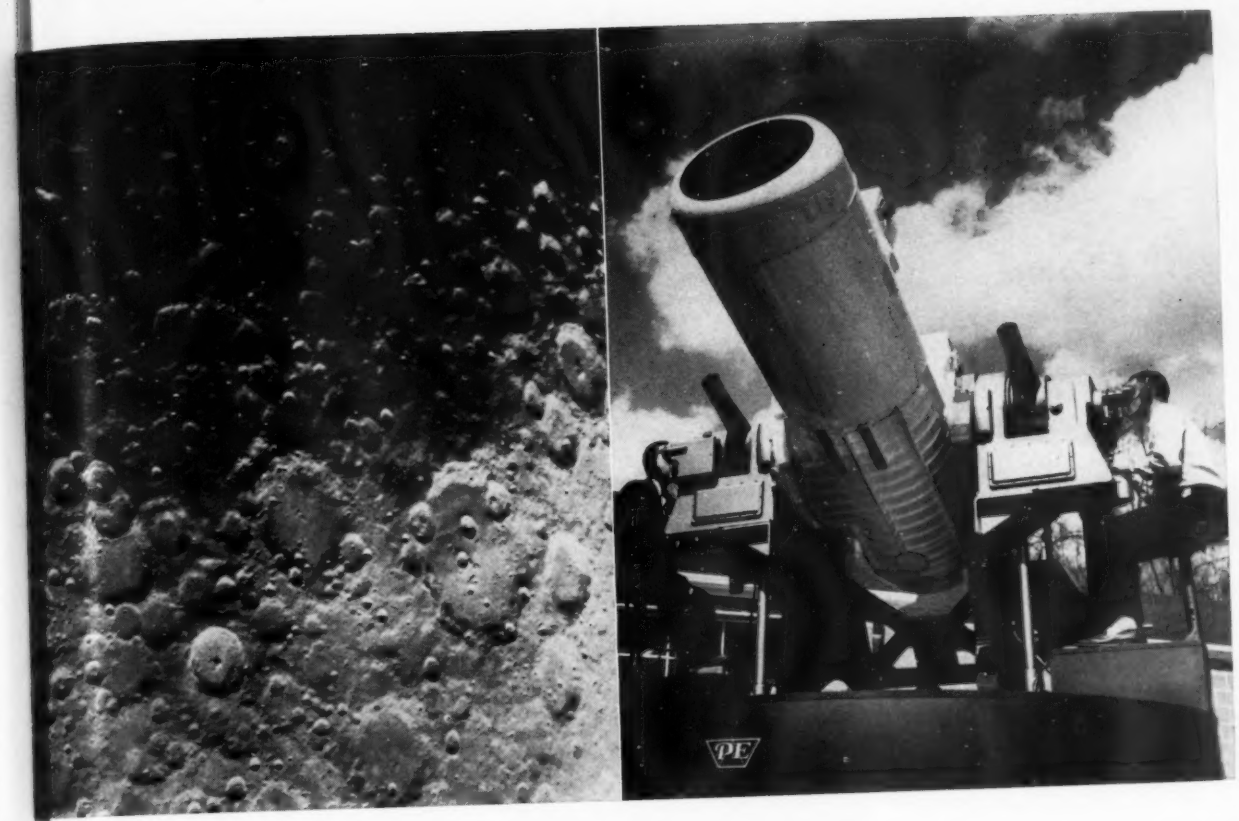


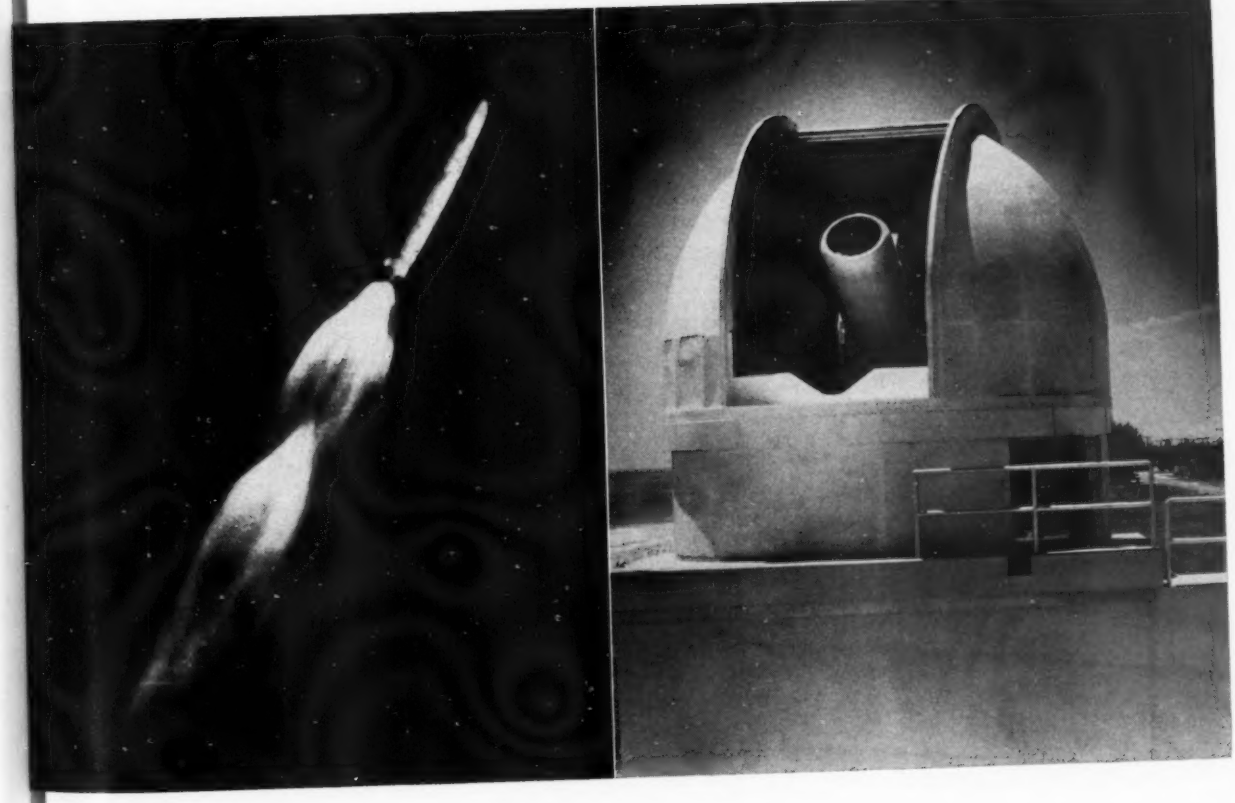
◀ SUN'S SURFACE IS GRANULATED

Profile of sun's surface, photographed through a telescope carried in an unmanned balloon. This picture, made during a 1957 ascent, is far superior to the best obtainable by using earth telescopes. It shows granulation on the sun's surface with one millimeter equal to an area of about 190 miles. The telescope, using a 12-in. system, was carried to 80,000 ft. above approximately 90 per cent of the earth's atmosphere. Three ascents were made in 1957 and four in 1959. The project, sponsored jointly by Office of Naval Research and National Science Foundation, is directed by Dr. Martin Schwarzschild, Princeton astronomy professor. Providing fundamental data on the sun's surface activity, it will give a better understanding of solar phenomena which often block radio communication.

USAF MISSILE, ▶ PHOTO BY ROTI

Recorded by the Air Force ROTI tracking system from a distance of 35 miles is an AF missile in flight over the Atlantic Missile Range. Providing information on flights launched from Cape Canaveral are three ROTI sites. One is at Melbourne Beach, a second is at Vero Beach and a third is in San Salvador. The double exhaust pattern was probably caused by shock waves. Although the ROTI is locked on the target by radar at launching time, the tracking is done by two operators, one of whom sets elevation the other azimuth. Attached to the ROTI is a 70mm camera loaded with shellburst film. Picture above missile, of moon, made by Melbourne Beach ROTI. At ten inches from eye, picture shows what moon would look like from 535 miles away. ROTI program is estimated to have cost over $1,000,000.





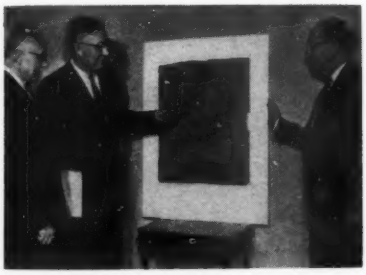
SCIENTISTS STUDY AERIAL GHOSTS

Three Kodak researchers report on their photographically-instrumented study of a problem which often confronts workers in photo instrumentation: "ghosts" in turbulent air that degrade the image in long-distance terrestrial photography. One solution: keep your chin—and camera—up

Ghosts of one sort do exist. Not only do they surround all of us, they have some pesky habits, particularly when the apparitions spook photographers and other users of telephoto lenses. Three Kodak research scientists, R. N. Wolfe, C. A. Morrison, and H. P. Condit are engaged in research on the ways of the phenomenon—of which they have some cogent proof. The picture (*right, below*) shows a whole haunt of them.

Although elusive and somewhat difficult to pose for a portrait, the effect is by no means supernatural. The theory is that the bands of light in the picture are caused by sections of air slightly different in index of refraction from the surrounding air. They act as prisms to affect any light passing through them. Besides reducing the sharpness of images made with telephoto lenses, the 2 to 8-ft. air pockets cavorting in atmospheric turbulence make themselves apparent in the twinkling of stars, the "boiling of optical images of distant terrestrial objects," and even perhaps some phenomena weird enough to give a faint-hearted non-scientist the willies.

For their study, the scientists took up one manifestation of atmospheric turbulence reported in scientific literature some 70 years ago: when a small-source light is projected across some distance of ground so that it falls on a plane surface, a pattern of bands of light and dark may be observed playing



Researchers Morrison, Wolfe and Condit, fresh from their ghost chasing view fruits of their labor.

Ghosts themselves show up on print of slow film negative as ripples of attenuated and reinforced light. Slow film cut starlight fogging.

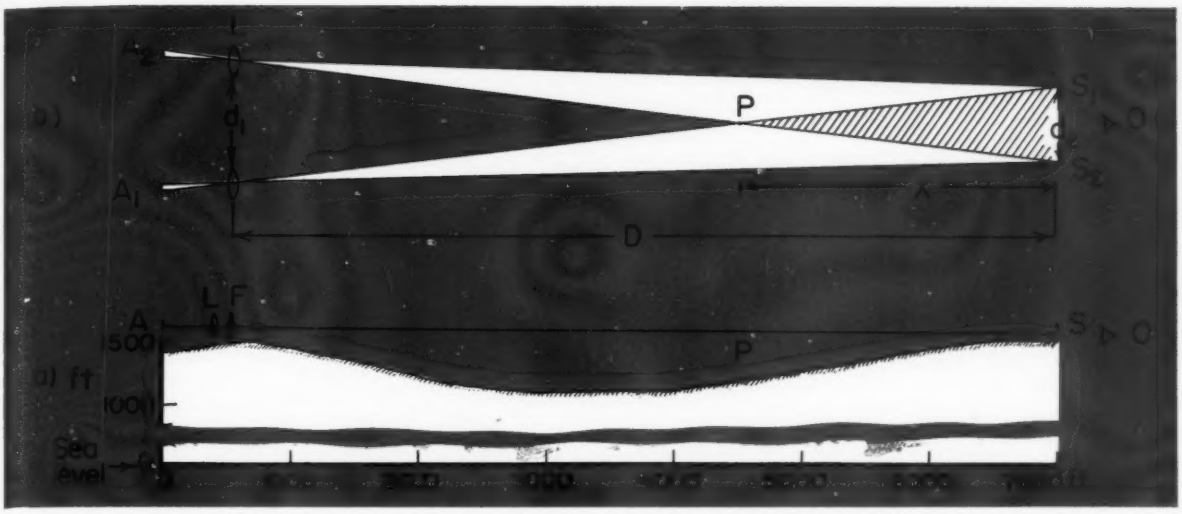
across the plane surface. The bands are attributed to the inhomogenous "ghosts" in the air between the light and the surface.

The scientists set up their equipment on either side of a valley near Candice Lake in Upstate New York on a moonless night.

They reported their technique in the August 1959 issue of the *Journal of the Optical Society of America* as follows:

"Such shadow bands, the observation of which serves as a basis for the technique about to be described, were observed by means of the apparatus shown schematically in the diagram. The light source, which was located at A, was an Osram HBO-107 high-pressure mercury arc. This was imaged across a valley at a distance of 1.3 miles (7000 ft.) onto the screen S by means of lens L, which was an f/3.5 telescope lens having a focal length of 180mm and which was equipped with an iris shutter F for later use. The screen, 4 × 6 ft. in size, was of a type designed for rear projection. Since the image of the source at this distance approximated a 20-ft. circle, the screen intercepted only a part of the total beam.

"The pattern of shadow bands was observed on a clear, moonless night by an observer O, who was situated behind the screen. The pattern of bands could also be easily seen on the front of the screen and on all other reflecting objects on



Diagrams of elevation (a), and straight-down view (b) depict experimental designs for turbulence study. In diagram (a) a single light focused by a 180mm lens across a valley is intercepted by disturbance at P to form a shadow band on screen S. Diagram (b) shows an adaptation of the design to form a stereoscopic view of the disturbance.

which the light fell. . . .

"The photograph of such a pattern . . . was made by opening the shutter (*Fig. 1a*) to expose a sheet of 22 × 28-in. Kodak Commercial Film for 1/25 sec. The film was supported in a plane parallel to, and just in front of the screen S. It was developed in Kodak Developer D-19 for 5 min. at approximately 70°F. Such photographs have also been obtained by Siedentopf and Wisshak. (Reported in *Optik 3*, 430, 1948)

"The pattern is the result of one or more elements of inhomogeneity in the atmosphere in the path of the light rays striking the screen. The deviations of the rays result in either an enhancement or reduction of the illumination on an area of the screen. If the disturbance is caused by a highly localized inhomogeneity, its position [P, in the diagram] in space can be determined by the method of triangulation in terms of the displacement of the pattern on the screen caused by moving the light source A. An alternative method (illustrated in upper diagram), is to use two sources at A_1 and A_2, respectively. The sources are at a distance D from the screen S, on which the pair of patterns due to the element P is separated by the distance d_2. If the distance between the sources is d_1, the separation of the patterns is d_2, and the distance from the element P to the screen S is X, then by similar triangles,

$$\frac{X - D}{d_2} d_1 + d_2$$

The elements of the pattern which are caused by such localized inhomogeneities can be observed stereoscopically in their proper relative positions along the optical path by polarizing the light emitted by the two sources, respectively, in mutually perpendicular planes with polarizing (Polaroid) filters combined with Kodak Wratten Filters No. 4 (yellow). The patterns are viewed through the back of the screen with polarizing filters so that the right eye sees one image and the left eye sees the other.

The maximum possible separation of any pair of pattern elements resulting from a single atmospheric inhomogeneity must be equal to the diameter of the images of the sources if the pattern is to be seen stereoscopically. At this maximum separation, the left-hand edge of one of the beams and the right-hand edge of the other illuminate the inhomogeneity. Then the separation d_2 would equal the diameter of each of the images; thus, for an element of the pattern to be seen stereoscopically, the inhomogeneity must be located within the area S_2PS_1. Inhomogeneities illuminated by only one beam would form a pattern on the screen, but they would not be seen stereoscopically.

Since other inhomogeneities between P and the screen might alter the distance between the pairs of pattern elements, the position of a given inhomogeneity, as determined stereoscopically, is not necessarily related to its actual position. The fact, however, that it is seen stereoscopically means that it is within the shaded area S_2PS_1. Thus the distance X is the maximum distance that the inhomogeneity can be from the screen when it is seen stereoscopically. . . ."

Wolfe, Morrison and Condit hope to make further investigations which may provide photographers with additional information on how to reduce the ill-effects of the phenomena on long-distance ground photography. According to Condit, four methods are presently known. The first is to get the camera off the ground. Five feet is a better distance than two feet, he says, but the separation soon reaches a point of diminishing returns where additional distance may not help much. The second method is to get the subject off the ground.

The third expedient is to choose a slightly overcast day (or night). Sunlight beating down on the ground sets up quite a stir in the air immediately above it. At night the heat transfer is in the opposite direction—but the effects are similar.

Another possibility is to decrease exposure time greatly.

Dr. Wolfe adds that the only way to completely eliminate the effect is to follow the lead initiated by astronomers: take your optical equipment in a balloon above the broil of earthly cares.—THE END

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by Ernest E. Reshovsky

PHOTO INSTRUMENTATION

Astrophotography color problems solved by Mt. Wilson photog

A breakthrough in astronomical color photography was achieved after several years of research by William C. Miller, research photographer of Mt. Palomar and Mt. Wilson Observatories, Calif., when he managed to produce the first really satisfactory color shots of galaxies and nebulae.

The pictures created quite a stir when they were reproduced in the *National Geographic* magazine, May, 1959 and in *Life* magazine in April, 1959. There were no precedents and no previous data to follow in solving the technical problems of the project. One of the hurdles was to overcome the effect of reciprocity failure on the color films; exposures ran as long as 4¾ hrs. Super Anscochrome Daylight Type film was chosen for its speed, the fastest available.

At the outset, Miller and his advisors decided to study necessary corrections, for both distorted color balance and for ion contrast, at the processing laboratory. Working for two years on tests of emulsions and duplicating techniques with Floyd Hacker of Rapid Colorprint Co., Glendale, Calif., Miller finally had all the various necessary correction filter combinations worked out before he took the actual pictures.

Emulsion testing

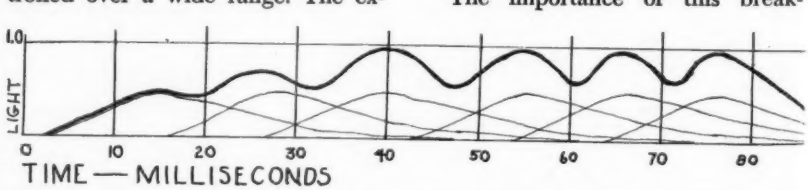
The testing of emulsions and necessary correction filter combinations was done by means of a spot sensitometer. This instrument exposes on samples of color film a series of small spots of accurately graded intensity. The brightness of the spots was controlled over a wide range. The exposure tests ranged from seconds to over five hours on the samples of Super Anscochrome, Daylight Type.

During the tests with the spot sensitometer, exposure was increased by a factor of 3 for every 2½ times decrease in subject brightness. These test strips were given very careful normal-speed processing. Miller explained: "Careful analysis of the test samples gave us the data necessary to correlate the change in color balance with the length of the exposure time. We could tell what color correction filters were needed to bring the sensitometer strips back to neutrality when they were reproduced on Ansco duplicating film." Hacker said in this connection: "Because each subject was exposed for a different length of time (20 min. for the Crab Nebula up to 4¾ hrs. for the Andromeda star system) each one had a different reciprocity failure, which meant a different amount of filter correction."

It was also very important to increase subject contrast at the duplicating stage, since the long exposures involved produced a background light level which was much too high to pass as night sky. In addition, to careful masking, Hacker employed the Chromastat process, an accelerated technique developed by Rapid Colorprint Co., to raise contrast in transparencies chemically during processing.

These drastic changes in processing introduced the need for still further color correction. Finally the filter corrections ran from the 10Y filter on the shorter exposures as to much as 30M plus 80Y filters on the longer ones.

The importance of this break-



Time-light curve as produced by six AG 1 zirconium-filled flashbulbs in contact.

through in color astronomical photography is explained by Miller: "No one has ever seen these objects in color because they are so faint that the human eye, even when assisted by the largest telescopes, can only catch the vaguest suggestion of color. The eye loses its sensitivity to color in faint light before it loses its ability to see the faint light . . ." Miller went on to say that for years astronomers have known that color exists in nebulae and galaxies as a result of their study of them with spectrographs and from black-and-white negatives made on panchromatic emulsions through filters.

Working with the giant 200-in. Hale telescope (f/3.6) and the 48-in. Schmidt-type camera (f/2.5) at Mt. Palomar, Calif., Miller is continuing to add to his unique set of color pictures which are not only of the greatest scientific interest but also works of sheer beauty.

Flashbulbs for high speedline

The Sylvania FloodFlash FF-33 bulb as the name implies, is a flashbulb of long duration. It was designed for illuminating scenes for high-speed motion picture photography. Although the bulb burns for 1.75 sec., a look at the light curve produced by the FF-33 shows that about 1 sec. duration is well above an output of 175,000 lumens, while the average level for the whole 1.75 sec. is 75,000 lumens. If a longer duration is desired several of the FF-33s can be flashed in sequence by means of a timing switch. The manfacturer has worked out a table for the number of lamps required for sequence firing when the duration of the event should exceed 1.75 sec.

One of the obvious advantages is the absence of heat which accompanies the high-intensity lights often used in high-speed motion picture work. A manufacturer points out that the new midget zirconium flashbulbs (M 5, M 25, AG 1, etc.) can be fired in series by physical contact. A long duration flash can be built by simply touching a series of these zirconium filled bulbs to each other, with only the one lamp actually wired to electricity. A clip of the new AG 1 bulbs, for instance, (they are packed six to a clip) can be used to produce a flash the duration of which is 80 milli-seconds, longer than the old No. 31. The duration can be extended at will with the addition of further zirconium filled bulbs. The most important thing, however, when employing this technique, is that the glass of the bulbs touch each other all the way along the line.—THE END

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MICROREPRODUCTION

(*Continued from page 32*)

ment and the ratio of reduction. Therefore unlike motion picture practice, frame size can be considered as a useful variable in microfilming.

Placement can offer some problems. In microfilming the ultimate objective is to read the reproduction and each exposure is important. The relationships between the pages of the whole text, the reading line and the ultimate use must all be adjusted. There are two choices. The reading line can be placed parallel to the short axis of the film, that is the film width, or it can be arranged to run parallel to the long axis or length of the film. When these possibilities are coupled with variable frame size and variable ratios or reduction it is apparent that relatively wide latitude is available to the operator in making computations.

If an average 9 x 6 in. book page is microfilmed at two pages per exposure with the reading line parallel to the length of the film, a reduction ratio of 9-10 diameters can be used. Approximately 1000 exposures or 2000 pages will be accommodated on a standard 100-ft. roll of microfilm. The same book on the same roll length two pages per exposure with the reading line parallel to the short axis or width of the film will require a reduction ratio of 12-13 diameters and will produce about 1600 exposures or 3200 pages. The key in this instance is the need of the user and how he plans to use the microfilm including equipment available for the purpose. Most libraries supplying microfilms of books charge 4 cents per exposure. Placement therefore has some importance to the supplier. Again if the film will be used for continuous electrostatic paper prints, then the first placement is desirable, for the enlargements in roll form can be run through a folding machine and bound into a facsimile volume. It may be worth noting that careful selection of placement and the use of the variable frame can result in economies of from 10-20 per cent in making continuous paper prints. The aim should be to reduce the space between the exposures to save paper.

With these basic concepts in mind, methods will be outlined in the next column which will enable those interested in the field but not yet experienced to verify them personally. In the process it will be difficult to keep from learning the elementary basic technology which is essential for future progress and application.

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PMI'S DIRECTORY OF INDUSTRIAL DEALERS

These firms are specialists in sales and service for photography in industry — for complete satisfaction all ways, always buy from your local industrial dealer

CALIFORNIA

The Harwood Co.
1141 West Valley Blvd.
Alhambra—CU 3-6551

Lloyd's Camera Exchange
1612 Cahuenga Blvd.
Hollywood—HO 7-7189

Standard Camera Supply
7560 Melrose Ave.
Los Angeles—WE 6-8284
Industrial—Graphic Arts—Verifax Supplies

Gordon Enterprises
5362 N. Cahuenga Blvd.
No. Hollywood—ST 7-5267
Rentals—Sales—Service

Hollywood Camera Co.
10611 Chandler Blvd.
No. Hollywood—PO 6-5578
Sales and Rentals
16mm — Still — 35mm

Brooks Cameras, Inc.
45 Kearny at Maiden Lane
San Francisco — EX 2-1902
"The Photographic Dept. Store"

CONNECTICUT

Jay James Camera Shop
182 Fairfield Ave.
Bridgeport—FOrest 7-6447
"Service and know-how"

When you phone or write to dealers please mention PMI'S Directory of Industrial Dealers. Thanks.

ILLINOIS

Altman Camera Company
16 South Wabash Ave.
Chicago—ANdover 3-0751
Chicago's Largest Camera Store

ILLINOIS (cont.)

Standard Photo Supply Co.
43 E. Chicago Ave.
Chicago—SUperior 7-3124
Specialist to the Professional

Watland, Inc.
7724 South Claremont Ave.
Chicago—PRospect 8-4400
A—V— Industrial—Verifax—Graphic Arts—Micro Film

Oak Park Camera Co.
1023 Lake Street
Oak Park—Euclid 6-6447
Professional — Industrial — Audio Visual

Klein's Photo Center
225 Washington St.
Waukegan—ON 2-4530
Equipment — Supplies — Sales — Rentals

INDIANA

Hoosier Photo Supplies, Inc.
51 Monument Circle
Indianapolis—ME 2-2531
Industrial — Graphic Arts — Verifax — Retail

KANSAS

Bob Gaskin's Industrial Photo Sales
631 E. Harry
Wichita—FO 3-4746

NEW JERSEY

Schaeffer Camera Co.
89 Halsey St.
Newark—MAin 2-2383
52 Yrs. Servicing Photo Ind.

NEW YORK

Stickley-Siver, Inc.
59 Carroll St.
Binghamton—RA 4-4336
Covering Triple Cities, Elmira, Scranton and Ithaca

NEW YORK (cont.)

Aims Photo Equip. & Supply
133 Park Ave.
Brooklyn—Ulster 2-7300
S. Westchester, Nassau
Call Collect Enterprise 4441

Beverly Photo Supplies, Inc.
1760 Nostrand Ave.
Brooklyn—Ulster 6-8184

Spies' Camera Shop, Inc.
933 Franklin Ave.
Garden City—Pl 6-4687
Industrial—Verifax—Graphic Arts

Broadway Camera Shops, Industrial Dept.
870 Broadway
New York—AL 4-8021

Do other departments buy photo goods, too? Give them a copy of this Directory to get them local service by experienced personnel.

World Camera Co.
80 Wall St.
New York—HAnover 2-8060
"Trade-In-Specialists"

Attention Industrial Dealers

If you qualify, write for requirements for listing on this page.

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PMI
33 W. 60th St.
New York 23, N. Y.

OHIO

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206 East Market St.
Akron—BLackstone 3-3149
Methods and Materials Applied to Industry

Metzger Photo Supply Co.
1091 S. Main St.
Akron—JEfferson 5-2693
Everything Photographic

The Dodd Company
1025 Huron Road
Cleveland—MAin 1-0564

Arlington Camera Center
2118 Tremont Center
Columbus — HU 6-2684 — HU 8-9444—Audio Visual—Rental—Sales—Service

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Engler Photo Supply Co.
1643 South Boston Ave.
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"The Best Costs No More"

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Kadet Photo Supply Co.
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TEXAS

Patterson Photo Supplies
718 N. Stanton
El Paso—KEystone 2-6956
"Professional, Industrial, Commercial Sales"

FREE LITERATURE

For your copy of any free literature item, circle the appropriate number on the reader's service card, attached, page 83.

AUDIO-VISUAL

Picturephone **201**
McClure Projectors, Inc. Illustrated brochure includes specifications and prices for sound filmstrip projectors.

Recorded Music **202**
Boosey & Hawkes. 24-page catalog of recorded music available in tape or disc form.

35mm Projector **203**
S.O.S. Cinema Supply Corp. Specification sheet describes the operating procedures and power requirements for the X-Raydiola 35mm projector with variable speed drive, forward and reverse plus single frame projection.

Stop-Motion Projector **204**
Red Lake Laboratories. Illustrated specification sheet for the Red Lake 35mm Stop-Motion projector.

Rear-View Filmstrip Projector **205**
C.O.C. Industrial. Specification sheet for C.O.C. Examiner portable rearview projector. Includes price.

Sound Films **206**
N.Y. Department of Commerce. 78-page catalog lists hundreds of 16mm sound films available for free showings to industrial, commercial and other interested groups or clubs.

CAMERA & LENS

Framing Cameras **211**
Beckman & Whitley. 4-page illustrated folder describes Beckman & Whitley framing cameras.

Microfilm Camera **208**
Diebold Inc. Specification sheet for the Flofilm portable microfilm camera with magazine loading for copying material up to 11 in. wide.

Traid Winds **209**
Traid Corp. 16-page newsletter includes a directory of lenses for instrumentation application including the 165° optics for 16mm use.

High-Speed Cameras **210**
D. B. Milliken Co. 4-page illustrated folder gives general specifications of Milliken 16mm high-speed cameras of modular design. Also lists accessories available for all models.

EQUIPMENT

Precision Mirrors **212**
Fancro Mirrors, Inc. 24-page booklet gives specifications of mirrors and optical coatings offered by this Los Angeles laboratory. Included in the list are semi-transparent or partial-transmission mirrors, one-way, non-metallic, panchronized and T.V. mirrors.

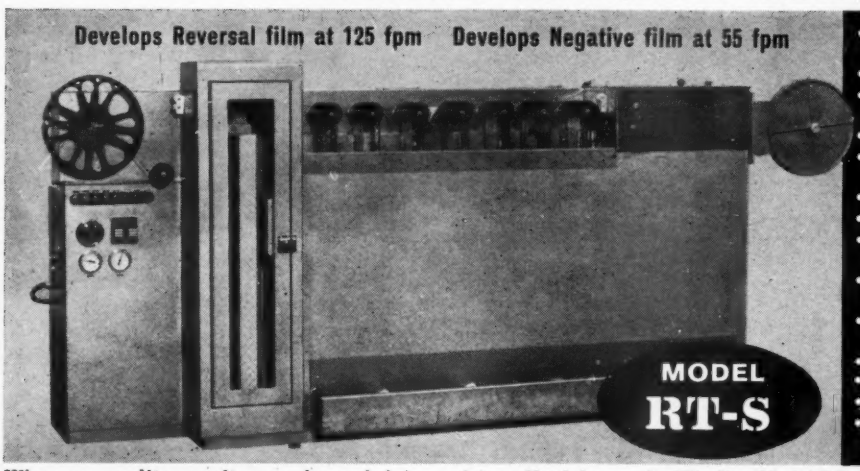
Stroboscopic Lamp **213**
Chadwick Helmuth Co. Data sheet for Strobex stroboscopic lamp and power supply which is capable of 0-100 flashes per second. Includes prices.

16/35mm Microfilm Processor **214**
Diebold Inc. Specification sheet for Flofilm 16/35mm Microfilm Processor.

FILMLINE ANNOUNCES

WORLD'S FASTEST COMMERCIAL PROCESSOR

FOR REVERSAL & NEGATIVE/POSITIVE 16MM FILM



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- Solution and drybox thermometers
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- Stainless steel, type 316, tanks
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Wherever quality results are demanded in the fastest processing time . . . or wherever illumination is inadequate for quality image density . . . this newest, fastest combination 16MM Reversal and Negative/Positive film processor . . . the Filmline Model RT-S will consistently provide the solutions to these processing problems.

For in-plant, high-speed photography . . . for television stations, racetracks, and motion-picture film labs . . . the Filmline Model RT-S *is the ideal machine* . . . providing quality results at speeds to 125 ft./minute . . . and permitting increases of the ASA index 1000% on DuPont or Eastman Reversal Emulsions.

Fully equipped, ready for immediate operation the Model RT-S offers you high cost film processing features for the low price of only $6,450.00.

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Get more information. Circle 436, page 83

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For Scrapbooks and Albums

(Illustration of two hole kit)

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Exciting new do-it-yourself binding kit, simple enough for a child to operate. Just insert the pages and punch, then pick a colorful binding tube from the spin dial base, snap into place and in seconds you have a real professional-looking colorful volume.

Other models available—
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Get more information. Circle 490, page 83

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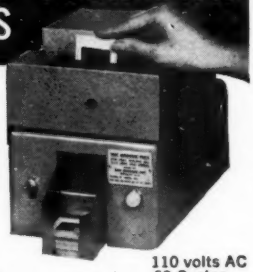

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Dept. M Phone Pioneer 8-7478

Get more information. Circle 484, page 83

Rotary Skydrop 215
Krank-N-Roll Manufacturing Co. Specification sheet for the Rotary Skydrop which holds 4 different rolls of seamless paper background material, any width and any length. Includes prices.

Laminating Press 216
Newmark Associates. 4-page folder lists advantages offered by the New-Marko press for laminating photos and cards in thermoplastic. Includes prices.

Simmon Masking Attachment 217
Simmon Brothers, Inc. Illustrated price sheet for the Omega Masking Attachment for use with Simmon Omega enlargers.

Hershey Sun Lites 218
Hershey Manufacturing Co. Catalog sheet describes the Hershey Sun Lite electronic flash units including the new Hi-Pro models.

Film Punches 219
Condit Manufacturing Co. Catalog sheet includes three models of film punches used for registration where films must be used for multiple exposures. Includes prices.

GRAPHIC ARTS

Photo-Composition Machine 220
Filmotype. Illustrated brochure describes operation of the Filmotype photo-composition machine.

Contact Screens 221
Caprock Developments. 4-page price list of grey contact screen for producing halftones from continuous tone copy.

Whiteprinting Machine 222
C. F. Pease Co. Specification sheet for the Scout semi-automatic whiteprinting machine. Includes prices.

Rotolite Whiteprinter 224
Rotolite Co. 4-page price list includes operating procedure for Rotolite whiteprinters for "on the spot" copying.

MOTION PICTURES

Castle Catalog 229
United World Films, Inc. 24-page catalog includes over 270 films titles.

Camera-Sync 226
Chadwick Helmuth Co. Data sheet for Camera-Sync system of taking slow-motion films of vibration tests using normal film speeds. Includes prices for Camera-Sync and 16mm pulse camera.

WHEN

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Now available in 18" and 26" sizes. Cut squeege time and labor in half with complete safety. A must for x-ray and litho men.

18" SQUEEGE-IT	$19.85
26" SQUEEGE-IT	$24.85

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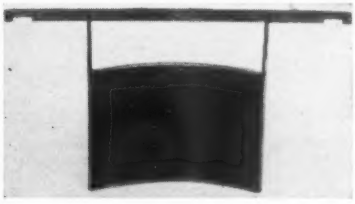
FILM HANGER



Loads quickly, like a cut-film holder. Film is secured by special design of the opposed grooves. No moving parts. Thin line design reduces turbulence around film edges. Grade 316 stainless steel throughout!

One-up	4 x 5	$1.85
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TUCSON, ARIZONA

Get more information. Circle 491, page 83

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CUTAWAY SECTION
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• FULL ONE-HALF INCH RADIUS ON ALL CORNERS AND CONTOURS
• ONE-PIECE HELIARC CONSTRUCTION
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. . . are custom-designed especially for top craftsmen in the photographic arts. Designed for those who recognize and appreciate streamlined beauty and utility . . . heavy gauge stainless steel (type 316) construction . . . initial and long-range economy. Arkay one-piece construction prevents accumulation of sediment or chemicals in seams—as occurs in two-piece panel-sinks.

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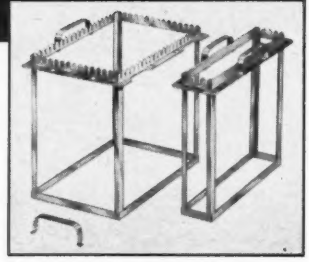
**In Any Size from 18" x 36" to 47" x 120" . . . Splash Panel, Stand and Shelf Optional. Priced as low as $119.50. Or will design to your exact specifications.*



Radically New . . . Drastically Improved
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Conserve time—money—patience—with the *first* rigid, non-rock, non-sway film hanger racks ever developed. Arkay 3-Way innovations:

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3. **Ribbed Vertical Flat Bar on Bottom Frame** for unobstructive burst distribution.

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Arkay

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ARKAY CORPORATION P-10
1570 South First St., Milwaukee 4, Wis.

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ADDRESS_____
CITY_____ STATE_____

Get more information. Circle 406, page 83

Magnetic Film Striping 227
S.O.S. Cinema Supply Corp. Price sheet for the SoSound magnetic film striping machine for 16mm film. Includes a list of specifications and features.

SERVICES

Film Lab 230
Capital Film Laboratories, Inc. 16-page brochure describes services offered by this D. C. firm and includes pictures of their plant.

Cine Equipment Rental 231
Birns & Sawyer Cine Equipment Co. 32-page illustrated rental catalog includes daily, weekly and monthly rates for motion picture cameras, lenses, projectors, studio equipment, accessories, etc. offered by this Hollywood company.

Animation and Art Service 233
Videart Inc. Brochure lists special effects, animation camera photography, and art services offered by this New York outfit. Includes a footage conversion chart for 16mm and 35mm film.

SUPPLIES

Chemical Catalog 242
Philip A. Hunt Co. 48-page catalog of Hunt Photographic and Graphic Arts Chemicals. Includes prices. Requests for this publication must be made on company letterhead.

Evaluating Color Negatives 244
Eastman Kodak Co. 24-page pamphlet gives solution to the problem of evaluating color negatives for volume printing. Four techniques which involve electronic equipment and that which uses the visual densitometer are explained.

Super Hy-Ortho 239
Ansco. Data sheet for Super Hy-Ortho sheet film. Includes time-temperature chart, tables for flashlamp and electronic flash exposures, filter factors, processing procedures, recommended developers, etc.

Retouching Color Negatives 240
Eastman Kodak Co. 6-page pamphlet gives information on retouching color negatives.

Film Speed Booklet 243
Carl Zeiss, Inc. 12-page film speed booklet lists exposure indexes of European photographic films as well as the American brands. A conversion table for transposing film speed values from differing systems is included.

Use this handy subscription order to receive your own copy of PMI every month.

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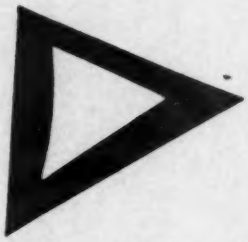

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NEW PRODUCTS

For additional information on any new product circle the appropriate number on the readers service card, page 83.

Anti-Static Aerosol Spray 104

Neutro-Stat, an all purpose anti-static spray available in 16 oz. cans has been announced by the Simco Co. It is said to neutralize and prevent the formation of static charges without leaving a greasy or discoloring deposit. It is non-toxic and non-flammable and dries almost instantaneously, according to the manufacturer. Price: $2.75 for 16 oz. aerosol spray can.

11 x 14 Deardorff View 105

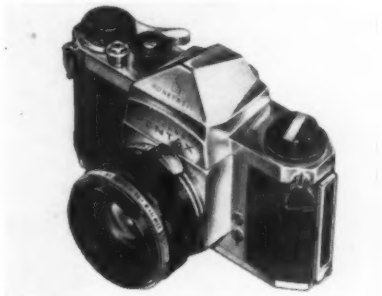
Similar except for size to the 4 x 5 Special, 5 x 7 and 8 x 10 Deardorff View Cameras, the new model has vertical swings of the front and back 30° each side of center, and later swings of 20° each side of center. Total rise and fall of the front standard is 7¾ in. Bellows capacity is from 5 to 42 in. The camera with the 11 x 14 Reversible back is 27 lbs. When folded up the overall dimensions are 20 x 18 x 6 in. This model which provides 11 x 14 and 10 x 12 negatives will accept 8 x 10 and smaller backs. It is said that when an 8 x 10 back is used there is no cut-off on the ground glass even when extreme swings are used: Price: $625.00 with 11 x 14 or 10 x 12 reversing back; $737.00 with 11 x 14 to 8 x 10 Revolving adapter and 8 x 10 or smaller back to fit.

Automatic Dissolve 107

Pellegrini-Piek recently introduced an automatic dissolve attachment (standard 48 frames) for the Bolex Rex which comes equipped with a Paillard factory made variable shutter.

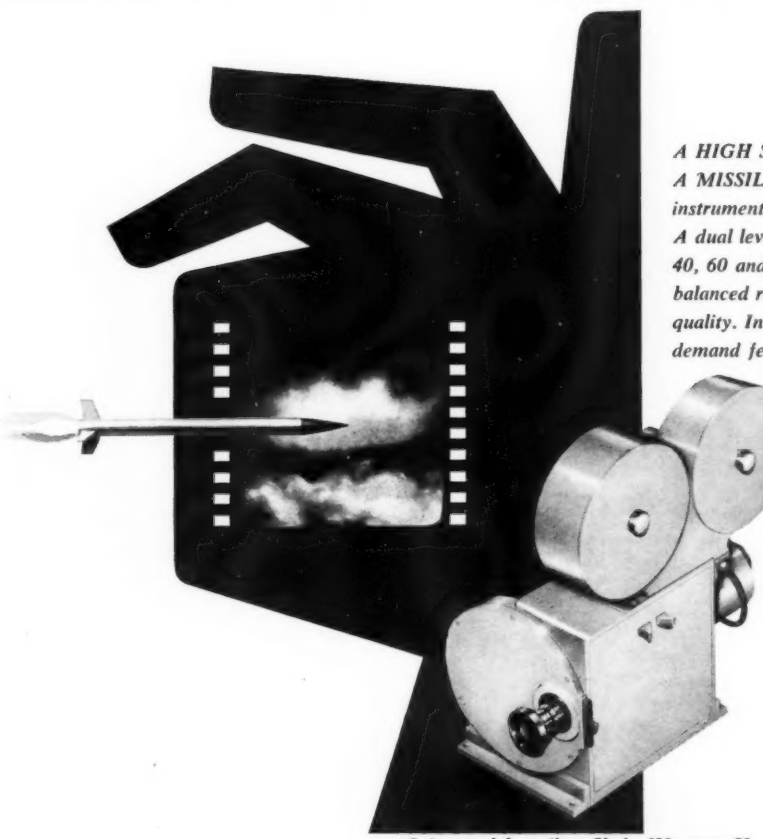
Heiland Pentax 108

The Honeywell Heiland Pentax H2 is the first product of a new sales agreement between the Heiland division of Minneapolis-Honeywell and the Asahi Optical Company of Tokyo. The Pentax H2 is a single-lens instant-return mirror pentaprism 35mm reflex camera. Claimed to be the lightest unit in its field, the camera weighs 27 oz. Features include: ten-speed focal plane shutter from 1 to 1/500 sec. plus T and B; single non-rotating film speed dial; single-stroke 90° rapid advance lever which cocks shutter; rapid film rewind crank; threaded lens mount which accepts Takumar lenses, 35mm through 1000mm; color coded film reminder dial and an indicator indicating shutter is cocked; FP and X terminals for flash synchronization. Price of the



unit with an F/2 Auto-Takumar 55mm lens is $179.50. Heiland announces that they will import a complete line of accessories and maintain a complete checking and repair service in Denver, Colo.

All previous models of the Asahi and Tower reflexes will be discontinued, but Heiland will accept previous models of the camera for repair.



A HIGH SPEED 70 mm. RANGE CAMERA STOPS A MISSILE FOR ITS PORTRAIT—This new instrumentation camera has a 2¼ x 2¼ square format. A dual lever gear shift permits speeds of 10, 20, 30, 40, 60 and 80 frames per second with a dynamically balanced register pin movement for optimum picture quality. Interchangeable 1000 ft. magazines with special demand feed spool brake. A.S.A. type 1 perforations on film. Can you see any possible applications where you can use this precise camera for your photo instrumentation problems? We'll tailor this 70 mm. camera to your needs. Write to Photo Instruments Division of

benson-lehner *corporation*

11930 W. Olympic Blvd., Los Angeles, California

Get more information. Circle 410, page 83

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- Complete **BLACK & WHITE** 16-35 mm film processing.
- Complete **EASTMAN COLOR** 16 - 35 mm negative — positive processing.
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MOVIELAB BUILDING
619 W. 54th ST., NEW YORK 19, N. Y.
JUdson 6-0367

Get more information. Circle 467, page 83

Grained Offset Plate 106

A mechanically grained sensitized aluminum plate for offset has been announced by the Polychrome Corporation. Designated "Granekote" the new plate is said to combine the advantages of a grained surface with the assurance of uniformity achieved by factory-applied coatings. According to the manufacturer, the Granekote plate has a retentive grip because of its grained structure—"thus providing reservoirs of both ink and water."

Portable Power 109

A portable electric power unit delivering 200-250 watts of 115-volt AC 60 cycle from a 12 or 14-volt wet cell selenium plate battery has been announced by Toropak, Inc. Completely self-contained the unit has a built-in charger.

The model P-14-65 stores 910 watt-hours of energy and model P-12-130

stores 1560 watt-hours of energy. Transistorized models of the Toropak power units as well as the Toropak inverters are available and are said to deliver up to 400 watts (1000 watts surge power) of 115-volt 60-cycle power. Prices range from $200 to $750.

Apache Fiberglass Sink 103

A fiberglass darkroom sink with standard fittings, available in two sizes, 28x48x5 and 28x80x6 inches has been announced by the Apache Photo Co. The sink is "panchromatic-green" colored fiberglass, has rounded corners, and is said to be light weight and "easy to install." Prices are $89.50 and $139.50, respectively for the 48 and 80-in. models. A print washer adapter is available as an accessory.

Elwood Foto-Meter 110

A reflection type meter to make it possible for the photographer to take light readings from the camera position and include only the small portions of the scene desired or to measure the high and low light values in a scene has been announced by the Fotomatic Corporation, manufacturers of the Elwood model 92 Foto-Meter. The meter is calibrated for exposure indexes from 1.0 to 16,000. The angle of light measurement is approximately 2 degrees. Price: $47.50. with carrying case.

Transfer Lens 111

A 5½-in. high resolution 1:1 Transfer Lens for cathode-ray tubes has been announced by the Perkin-Elmer Corporation of Norwalk, Conn. With a relative aperture of f/2 (at infinity) to f/22, it will cover a 4½-in. diagonal format. Object-to-image distance is 17.6 inches.

Color correction of the lens is said to be 4200A - 5200A, optimized for P-11 phosphor.

Optional equipment are a reflecting unit to permit bending of the light path, and a motorized control for remote adjustment of the lens iris. The latter consists of a special iris spur gear and a servo drive unit to operate the iris.

Missile Battery 113

A new automatically activated silver-zinc primary battery, capable of 31.0 watt-hours per pound and 1.7 watt-hours per cubic inch has been announced by Yardney Electric Corp. Weighing 72 pounds, it has a volume of 1290 cubic inches. Its shelf life in the dry condition is said to be about 5 years; in the activated condition, 8 hours.

The manufacturer claims that the battery can be activated and readied to meet specification voltages within 3 seconds, and can be discharged at numerous rates—ranging from rates even less than the 50-ampere rate (at 37 volts for 90 minutes) to 350-ampere rate (at 28 volts for 11 minutes).

Transistorized Recorder 114

An all transistor magnetic film recorder featuring encapsulated modular plug-in temperature compensated amplifiers and film capacity in excess of 1200 ft. has been announced by Hallen Electronics Co. Frequency response is said to be 30 to 13,000 CPS. The machine will record or playback and will operate from power supplied by a 24V battery or AC power. Entire recorder requires less than 30 watts and weighs 29 pounds. It is available as a portable or rack mounted unit for 16-17½ or 35mm film sizes.

For additional information on any new products item, circle the appropriate number on readers' service card, page 83

San-I-Tank 115

A concentrated anti-bacterial and deodorizing chemical called San-I-Tank, will be distributed by the Chemical Division of Danford Studio.

The new chemical is water clear and said to be non-toxic, non-corrosive and "will not harm either photographic film or paper". The dilution ratio is just a few drops per gallon. Price of a 4 oz. bottle is $1.50.

TONE REPRODUCTION

(*continued from page* 45)

Let's consider a few examples. Almost every photographer recalls from his early experience how disappointed he was with his first home portrait. "Even though the white background seemed to be adequately illuminated and the balance of light across the subject's face appeared just right, the photograph showed an almost black background, and one side of the subject's face had hardly any detail." You have heard this a hundred times. But it takes much experience before one learns to flood the background with light and to use what appears to be too flat a lighting balance on a subject's face to obtain acceptable photographic results. This is a perfect example of the difference between what the eye and film see when both are directed toward an illuminated scene.

Faber Birren gives us another example. A white chicken and a black chicken are viewed first in bright sunlight and next after the white chicken only has moved to the deep shade of a barn. In the first instance we say that we see the two chickens as white and black because one reflects much more light to our eyes than the other. But this explanation fails in the second situation because now the white chicken in the shade reflects *less* light to our eyes than the black chicken in strong sunlight. Yet we continue to recognize the two chickens correctly.

Now although the visual system can function through a remarkably wide range of intensities (from one to several million) at any one level of adaptation, the total range that we can distinguish at the same time is far less. In bright daylight this range is about 1:1000 and it progressively falls off to about 1:10 at quite low levels. Again photographic films differ from the eye because the response range of a film is fairly constant. Only the duration of exposure time has to be varied to compensate for different light levels, assuming constant optical conditions. Because of this property of the eye two adjacent luminance fields have to differ by a greater extent for us to distinguish them at low adaptation levels than at higher levels. Through a reasonable broad central region of light intensity levels it is generally stated that the change we see remains constant when the light is changed in a constant *ratio*. For example, sup-

(*continued on page* 88)

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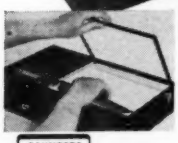

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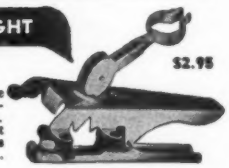

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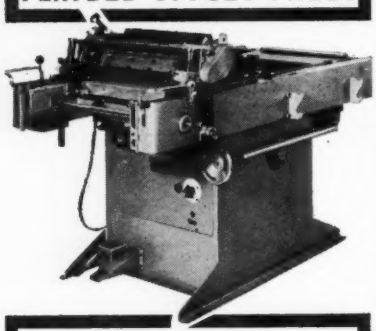

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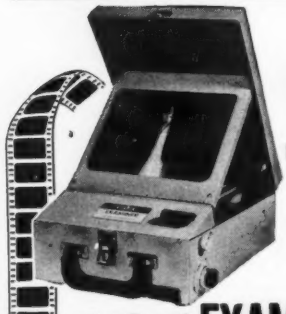

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TONE REPRODUCTION

(*continued from page 87*)

pose two tones of grey reflect 5 and 10 per cent of the incident light respectively. Under an illumination level of 100 foot-candles the *difference* in the light reaching the eye is 5 foot-candles, with on reflecting twice as much light as the other. Under 1000 foot-candles the *difference* is 50 foot-candles, exactly ten times the previous difference. Nevertheless, the change we recognize between the two luminances is constant, i.e., the two grey tones appear the same under both illumination levels, the reason being that in both cases the *ratio* of the reflected light is constant, namely, 2:1. We experience the same phenomenon in everyday photographic practice when viewing prints under different illumination levels. If these levels are not too far separated the steps between the different grey tones appear the same. But under a really poor light the print would change in appearance, as we have all noted in poorly illuminated exhibition halls.

Efforts have been made to derive data showing how the eye varies in its recognition of luminance steps at different adaptation levels. Such data could lead to characteristic curves for the eye which could then be introduced in the plotting of tone reproduction graphs to take into account the major subjective factor. Unfortunately, no results not based on certain unwarranted assumptions have yet been accomplished. One of the great difficulties in such work is our inability to measure sensation. Considerable data have been compiled on the ratios of luminances required to produce a just noticeable visual difference through a wide range of luminance levels. But we have no way of telling if the J.N.D.'s recorded at different levels correspond to equal sensation intervals. In other words, from physical stimulus values we cannot extrapolate a measure of sensation. Until this is done a complete theoretical solution to tone reproduction can hardly be derived.

OTHER SUBJECT PHENOMENA

There are a number of other visual phenomena that interfere with a perfect tone reproduction theory. It is well known, for example, that a light grey patch surrounded by a dark grey area appears lighter in tone than when viewed against a white background. With a white background it appears darker in tone than when viewed against no background at all. This effect is known as simultaneous contrast. It varies with the field size so that in an outdoor scene a large area of light grey against a large background area of a different grey tone may not exhibit the effect at all. However, these same areas reduced down within the boundaries of an 8 x 10-in. print may be small enough to be viewed simultaneously, whereupon the mutual enhancement of visual contrast occurs. This effect would be extremely difficult to incorporate into any tone reproduction theory.

Another phenomenon, known as successive contrast, arises when the eye views successively different areas of a scene. The immediately previous visual task has an influence on the following one because visual adaptation can take place under normal viewing conditions at a much faster rate than usually presumed. This tends to cause a light area to appear lighter if the eye passes to it after viewing a dark area and vice versa.

This does not exhaust the subjective factors that could be discussed. For example, we have only touched upon area effects which can exert strong influences under some circumstances. However, these few additional subjective phenomena should strengthen the statement that tone reproduction is indeed a complex problem. THE END.

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DIP AND DUNK

(*continued from page* 61)

exposed paper can be run through the machine at any time. The rate of processing is five ft. per min. Five ft. of 8 in. paper holds five 8 x 10 prints. The processing cycle is about 35 min.

Prof. Bowman quotes the Eastman Kodak Co. to explain how this short processing cycle is possible: "The chemistry of continuous processing is unlike that to which photographic laboratories are accustomed. Because there is a controllable rate of paper-solution contact, there can be a scientifically precise rate of replenishment. And because the stop and fix baths differ from conventional solutions, prints have excellent permanence despite the short washing cycle."

Automatic and adjustable controls are provided with the machine. The diagram indicates the use of conveniently placed storage tanks for chemicals.

The dryer shown is mated to the roll processor. The paper cutter separates the individual pictures after drying. It is power driven. The operator decides where to cut with the aid of a plastic guide over the face of the print. A footswitch activates the cutter for the shear. Automatic cutters which sense slits or graphite marks made on the back of the paper at the time of the exposure are available.

Other units indicated in the system are essential, Prof. Bowman feels, to bring to the photographer one of the outstanding benefits of automatic processing: strict adherence to the highest standards of technical quality.

Among them are a Hydromixer shown in the chemical storage area. This unit uses a submerged turbine pump to combine dry ingredients with water. Because of its design no air is beaten into the chemicals during mixing. It is designed to be mounted on rollers so that mixing can take place well away from the processing and sensitized material handling areas. It glides across the floor and through the light trap to pump fresh chemicals into the processing units when needed.

Replenishment chemicals for the film processor and the roll processor are stored in approximately-sized storage tanks near their respective processors. With them is a recirculation, filtration system to keep chemicals clean.

A tempering unit serves both processors, to keep them within

(*continued on page* 90)

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DIP AND DUNK

(*continued from page* 89)

strict temperature limits for correct processing at all times.

Prof. Bowman offers the unit as an example of the possibilities of increased efficiency in the darkroom. He thinks it by no means exhausts those possibilities; and he believes there is equipment to handle almost any industrial photo lab's problems, and in many cases the outlay for the necessary equipment is small indeed, considering the benefits.

The first step in analyzing the need for automatic equipment, he thinks, is a count of materials processed—sheets of film, rolls, number of contact prints, color prints, etc. This is part of the picture but not all of it. Another factor is work flow. If most of the processing is concentrated within a short period of time, say two months of peak load, the solution might be very different than a work load that is spread evenly throughout the year. A newspaper darkroom for example requires a very different set-up than does a mail-order house photo lab that produces a large catalog annually, although both may produce an identical number of negatives and prints.

Still other considerations are the trends of future work, the work undone that should be done, and the flexibility required. Prof. Bowman believes that in figuring costs, the key matter is not whether equipment will be used to its greatest potential at all, but rather whether it will be less expensive to add automatic equipment over a few years' time or to add to dip and dunk facilities and personnel. He points out that the salary paid to one additional staffer over a few years' time can add up to the price tag of quite a bit of automatic equipment. He also thinks that photographic brains and talent should not be wasted on coolie labor, if it can be avoided.

In considering the subject, Prof. Bowman feels, the industrial photographer might do well to study an efficient photofinishing operation or two to see what is being done with automatic equipment for black-and-white and color finishing.

There are many possibilities between the basic step forward of measuring negatives before switching on the printing light, and the all-out completely automatic system.

A bottleneck that is often the first to be broken is print drying. Most industrial units of any size recognize the superiority of a powered drum drier, although some still bump along with more primitive equipment.

Something less frequently used, is an automatic print straightener. There is no need for these units in many parts of the country, and in some areas flattening solutions perform the same job perfectly. Where low humidity is a problem, however, an automatic straightener can save hours of time every week.

Roll easels permit the economy and efficiency of roll paper handling—even without a continuous processing machine. Many of them will cut individual sheets from the roll and stack them at the side of the enlarger for conventional processing. Reels and reel loaders permit batch handling of 8-in. paper in lengths of 20 ft. or less. A standard 8 x 10 3½-gal. developing tank accepts one of these reels—so the photographer can develop 24 8 x 10 prints in 1½ min. A cylindrical unit will handle two rolls with 3½ gal. of solution—upping the figure to 48 prints. Standard drum driers dry the washed prints handily. All this holds true for color printing as well as black-and-white.

The Pako Print Finisher (or its predecessor) the Pakodoper, is a familiar sight in many darkrooms. It handles print finishing from the shortstop to the draining rack with dependable consistency. It takes a pretty fast printer to keep up with it.

Another system for speeding print handling is the use of Saran processing baskets, originally designed for color work with single sheets of paper, but perfectly capable of handling black-and-white prints. One unit on the market processes 30 sheets of 8 x 10 paper in a 3½-gal. 8 x 10 tank. Basket units come in many sizes—up to 20 x 24 in. and larger.

Electronic scanning, represented by the LogEtronics printers and enlargers, is another compatible unit to speed darkroom work.

The big guns in favor of automated processing, Prof. Bowman says, are economy, efficiency and a standard of technical quality that simply cannot be maintained with dip and dunk methods. Photographic science and engineering provides industrial photographers with the means to eliminate amateur methods and mystical guesswork. In their place, automation offers production and quality. Bowman thinks photographers cannot afford to pass it up.—THE END

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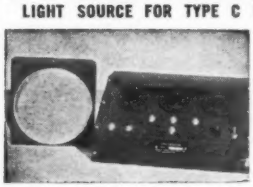

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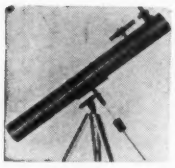

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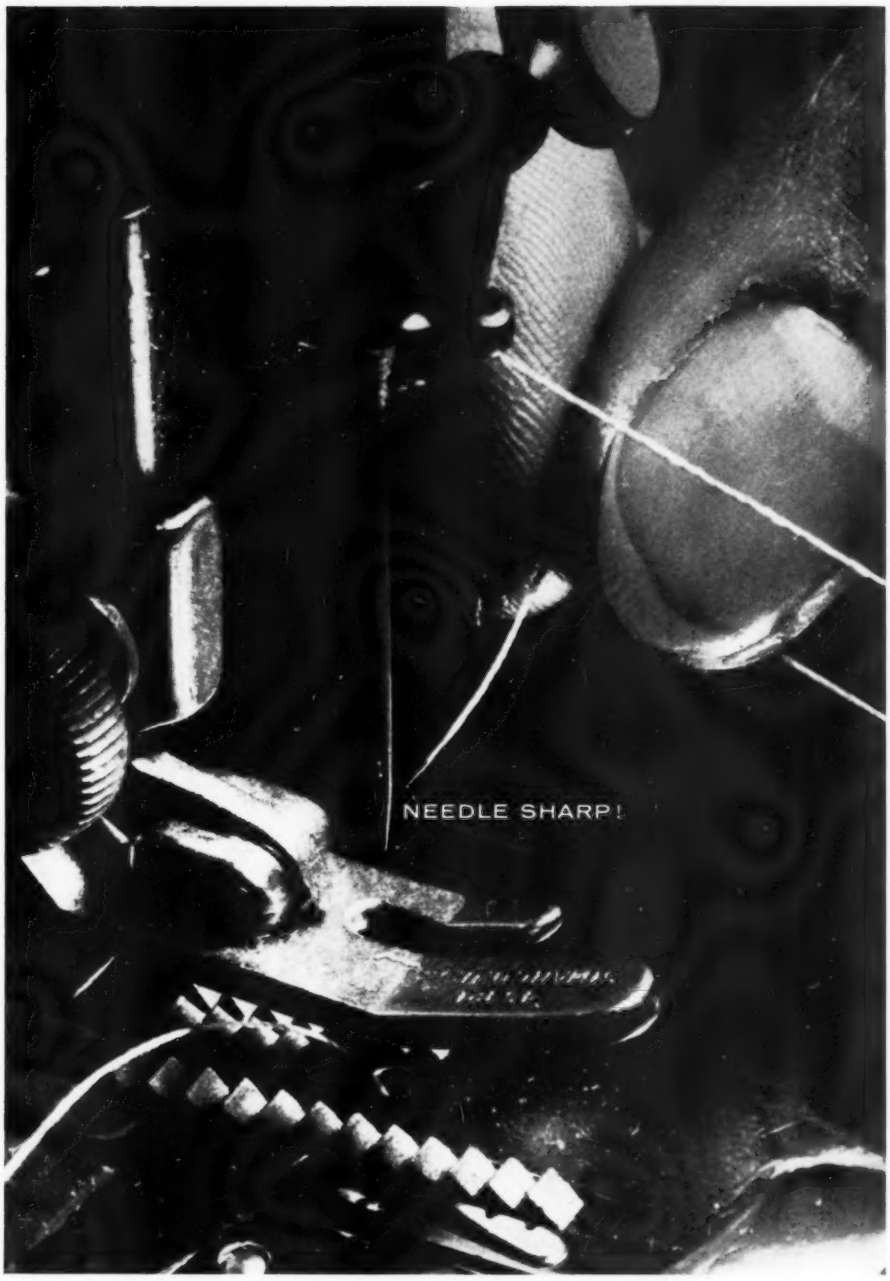

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